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Vol. VII. NEW YORK, JUNE 19, 1886. No. 25.

WE publish to-day's news regarding electric railways proposed for Scranton, Pa., Winthrop, Mass., and St. Louis, Mo. The world moves.

A NEW ENGLAND town was nearly wiped out of existence the other day. It had no fire alarm system. Further details of the event, and comment upon it, are needless.

THE $2,000,000 damage suit against the Western Union Company drags along from week to week, accumulating evidence and argument. Since our last report, the most material point that has been scored against the defendant is the exposure of the fact that its official records have been subject to various amendments and emendations to make them fit the explanations tendered to justify its action and methods. Should this fact be established beyond all question, it will place the Western Union Company in a very unenviable light.

THAT the proposition to handle a full train of standard railway cars does not dismay electricians is evidenced by the design, shown on another page, of an electric locomotive equal in power to the largest upon our great railways to-day. The details have been worked out with great care, and we have not the slightest hesitation in saying that such a locomotive, when required, will be forthcoming without delay. An electric locomotive of the design shown is peculiarly adapted to smooth working, all motion being rotary, and the moving parts directly connected. When we see the problem attacked with such earnestness, the time is not far distant when not only all city railroads, but many branches of the trunk railroads, will be operated by electricity.

THE ingenious lightning arrester devised by Mr. E. A. Sperry, which we describe in another column, by employing a weight accomplishes an object hitherto usually performed by means of the electric current. This recalls the utterance of the late Mr. C. F. Varley, who is said to have remarked once that he never employed electricity for any operation which could be effected by ordinary means. As an expression of individual opinion, this may be worthy of being cited in the present instance. But the rapidity with which many mechanical methods of operation have been superseded by those in which electricity is employed, is sufficient proof that the same idea is far from universally prevalent. As an aid to electrical operations, however, mechanical means should not be ignored, especially when, as in the present instance, they tend to simplify the apparatus.

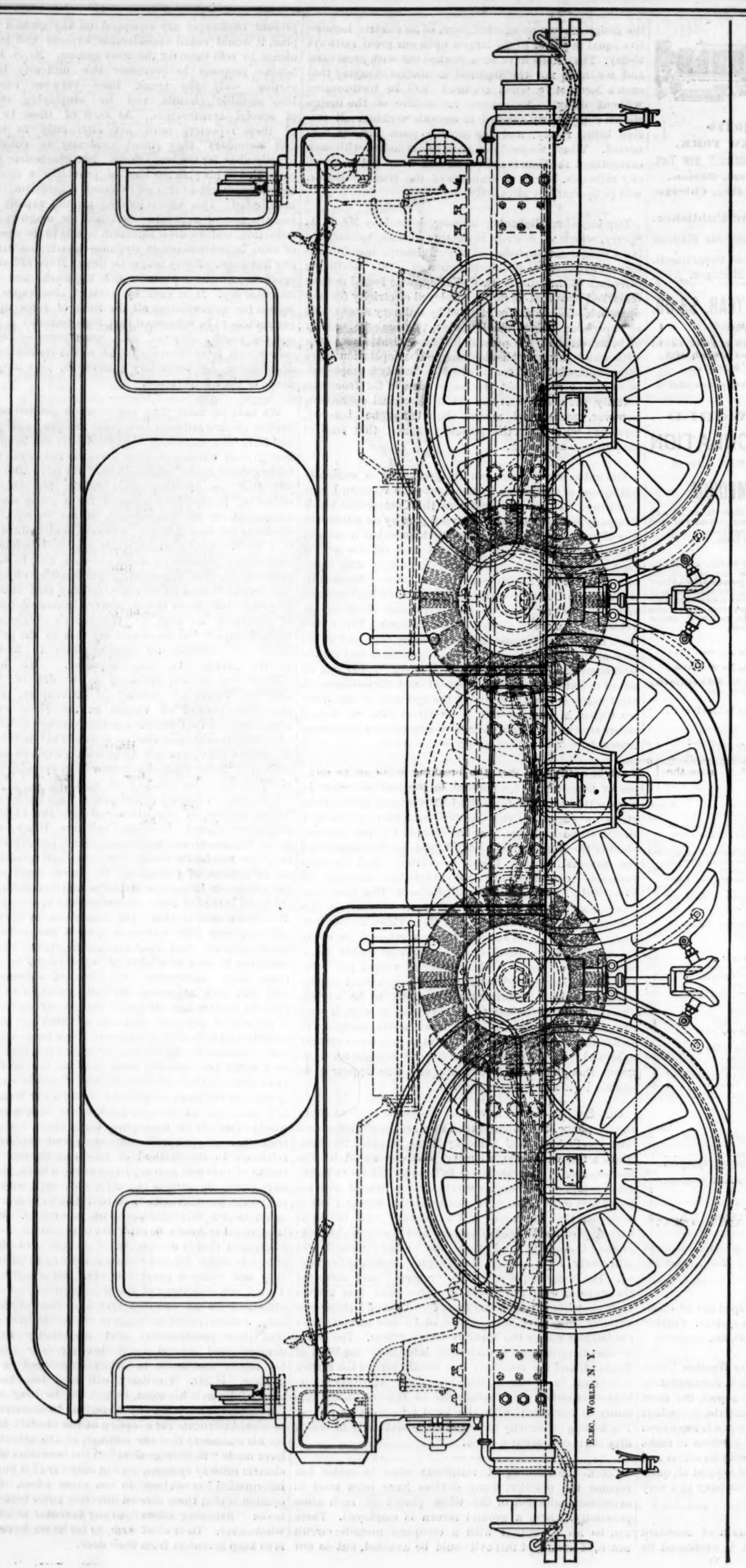
THE cable war goes on, but its great cost is evidently felt by one of the parties to the fight—the Western Union Company. It cannot be said that the Commercial Cable Company has been hurt in any vital part by its adherence to a 25-cent rate. It cannot pay dividends, but it can pay its way, and this is a state of affairs that the owners of the Commercial cables appear able to endure with equanimity for an indefinitely long time to come. Meanwhile the Western Union Company loses part of its land revenue and has to pay $700,000 in guaranteed dividends on $14,000,000 American Cable Company's stock. This would dig a hole in any income, however large, and just at the present time the Baltimore & Ohio Company is making the land competition so hot that the Western Union can ill afford to have its resources crippled and diminished. A great many people are enjoying the spectacle of the Western Union in distress, but we must confess we would rather see the telegraph business conducted on a remunerative basis.

ON pages 286 and 287 of this issue will be found a number of letters from leading manufacturers and users of wire in this country for electrical purposes, giving their views in regard to the practical adoption of the new British standard gauge, that has already had the indorsement of the National Telephone Exchange Association and the National Electric Light Association, and has been favorably considered by the American Institute of Electrical Engineers. It will be seen that the new gauge has still to prove its right to adoption in this country. Of those who express their views in our columns, 8 seem to be in favor of the new gauge, 3 are not in favor of it, 3 are indifferent, 5 buy wire by the thousandths of an inch, while 2 order by weight per mile. Here is variety enough, and all will admit that greater uniformity is a consummation devoutly to be wished. The two associations named above might do well, if they care about the subject, to take more active measures to secure the adoption of the new gauge they have already approved. Possibly they might foster a demand for legislation, though our correspondents, as a rule, appear to be against legislative interference.

OUR English cousins have been somewhat slow to adopt the telephone, but now and then they are greatly impressed with its efficiency and value by some unusual incident. Thus, a few weeks ago, a burglar was discovered by the housekeeper in a private house in Bristol. Under ordinary circumstances, the burglar would have gotten off with his booty and might even have murdered the woman; but it happened that the house was connected with the local exchange of the Western Counties and South Wales Telephone Company, and thus the affair turned out differently from what the burglar naturally expected. The housekeeper called up "central," and surprised the operator with the novel announcement that thieves were prowling around the house. "Central" thereupon without delay advised the police, and a few minutes later the burglar was in the custody of an officer. The arrest by telephone aroused considerable interest in the West of England, and the company has neatly turned the matter to account in a timely little circular. All timid householders of either sex, fearing fire or thieves, should certainly be connected with the local telephone exchange. The feeling of security to be gained would well be worth fifty cents or a dollar a week.

SINCE the running of telephone wires in cables has become the practice, many devices have been tried to overcome induction of the wires placed in such close proximity, where a ground return is employed. There can be no doubt that with a complete metallic circuit much, if not all, of this evil could be avoided, but as our present exchanges are equipped on the ground return plan, it would entail considerable expense and inconvenience to refit them for the other system. Mr. S. F. Shelbourne proposes to overcome this difficulty by converting only the trunk lines between exchanges into metallic circuits, and by employing repeaters of special construction. As each of these two coils of these repeaters must act alternately as primary and secondary, they must evidently be constructed exactly alike for the best effects. Mr. Shelbourne has also embodied in his plan the idea of providing a continuous magnetic circuit so that no external magnetism shall be manifested. This idea is gaining ground rapidly in the construction of apparatus designed for magneto-electric induction, and we drew attention to this in the description of some improvements in dynamo-electric machinery in our last issue. Every magnetic line of force radiated into space constitutes a waste in such apparatus and reduces its efficiency. It is only by a strict observance of the means for concentrating all the lines of force upon the conductors to be influenced that high economy is possible and the results obtained with some forms of induction coils which have been employed in the system known as distribution by secondary generators, give ample evidence of their importance.

WE have on more than one occasion pointed out, since surface electric railways have come into practical operation and have been successful, that electricity can be applied to still greater advantage upon elevated railways, or even underground roads, within cities. We have also pointed out that an elevated way, where no other traffic comes in, is especially adapted for a cheap and simple equipment for the transmission of the current. These views of the case are not, however, entertained by Mr. C. J. H. Woodbury, who recently appeared before a Massachusetts committee on street railways, and, in behalf of property owners representing $20,000,000, objected to the construction of an elevated railway that should employ electricity as its motive power. In some departments of electricity we hold Mr. Woodbury's opinions in the highest respect, but we cannot say that in the present instance his remarks did justice either to himself or to the system he was opposing. His historical review was faulty, speaking as it did of "Davidson, of Vermont," instead of Davenport, and fixing Paris instead of Vienna as the place where the reversibility of the Gramme machine was first noted. Then, admitting that surface electric railways are successful, Mr. Woodbury held them still to be merely *experimental*. As several of these roads have now been operated commercially for from one year to four, we think it only reasonable to contend that the experimental stage has been passed. To say nothing of exhibition railways, the Lichterfelde, Frankfort, Vienna, Portrush, Brighton, Blackpool, Bessbrook, Baltimore, and Montgomery roads are all business enterprises, run for the money they make, and several of them are in process of extension. Of course, every year sees improvements in electric railways and "tramways," but the same is true of every other electrical application. Mr. Woodbury asserts that "the conditions of these street railways bear little relevancy to those demanded for elevated railways, and even successful results upon them could not be used as a basis of what might be expected from their application to elevated railways." To bear out this argument, he calls attention to the fact that the surface cars are small, run slowly, and must stop at the will of patrons; while the elevated cars must run quickly and stop at long intervals. Now these are just the very reasons why the electric elevated road can be operated more economically than that on the surface. To yield their greatest efficiency motors should be run at high speed, and the power required to bring a car from rest to full speed on an elevated track where stoppages are few would evidently be multiplied many times on a surface road where stoppages are numerous and haphazard. In reference to the method of attaching the motors to the trucks of cars and gearing direct to the wheels, Mr. Woodbury makes the curious objection that such motors could not be run in exact unison. Actual tests have over and over again shown this criticism to be groundless. We might take up other points, but refrain, only adding our humble conviction that if the people of Boston give their preference to steam for the elevated railway in their streets, they will make a great mistake. All who live in New York know something of the abominations and nuisances attendant on an elevated system worked by steam, and some of us have seen sufficient of electric railways to know that their practicability and desirability have been demonstrated beyond doubt, leaving their substitution for steam and horse in urban service only a question of time. If Mr. Woodbury will look into the subject as carefully as is his wont, he will not be long before he advocates the adoption of the electric locomotive, just as he would advocate the adoption of the electric light. As for his statement that the directors of the elevated roads have made "flattering offers" to the inventors of various electric railway systems, we can only say that our private information has not been to the same effect. Our own opinion is that these shrewd directors know better than to make "flattering offers" to any inventor of any device whatsoever. Their chief wish, so far as we have learned is to keep inventors from their door.



THE LARGEST ELECTRIC LOCOMOTIVE EVER DESIGNED.

ELEVATION OF BENTLEY-KNIGHT SIX HUNDRED AND SEVENTY HORSE-POWER ELECTRIC MOTOR.

ELEC. WORLD, N. Y.

The Bentley-Knight Electric Locomotive.

During the past year extraordinary popular interest has been manifested in everything pertaining to increased rapid transit facilities. The extension of the New York and Brooklyn elevated lines, the proposed introduction of the same system throughout our greater cities, and the preliminary work of the several sub-surface railway companies, have stimulated the discussion on the merits of such systems of motive power as may satisfactorily accomplish the work of the steam locomotive without the numerous disadvantages attendant upon its intramural use.

In this connection, the illustration herewith of the electric locomotive designed by the Rhode Island Locomotive Works can not fail to be of interest. This illustration is taken from the working drawings of the Bentley-Knight Electric Railway Company, accompanying various estimates lately submitted by its engineers, Messrs. Edward M. Bentley and Walter H. Knight.

This locomotive is especially designed for light passenger work. It is standard gauge, has a wheel-base of 12 feet, and weighs about 48,000 pounds, all of which weight is equally distributed upon its six-coupled sixty-eight inch driving-wheels. The nominal electrical capacity of its twin motors is 500,000 watts. The motor armatures are thirty-six inches in diameter, and exert their force upon the drivers without the intervention of any of the various forms of gearing which some think have seriously impeded the successful introduction of very large electric railway motors. It is equipped with electric headlights, bells and automatic tubular electro-magnetic brakes, and is fitted with electric connections for incandescent lamps and brakes throughout the train. It has no reciprocating parts, and is equally adapted for use with overhead, surface or sub-surface connection with the central power station of the line.

The company's motors are built so as to be exceedingly powerful, solid and compact, and are balanced to a nicety; and the care with which their interchangeable parts are manufactured renders impossible any serious interruption of work from ordinary accident.

Reckenzaun's Electric Launch.

The London *Electrical Review* gives an interesting account of a recent trip of Mr. Reckenzaun's storage launch: "Scudding along on the bosom of Father Thames without sign of oar or sail or steam boiler! Truly, it was a delight and a wonder. No visible motive power, and yet we shot through the water at a rate which quite outdistanced the bulldog tugs and even caused consternation and surprise on the bridges of the larger steamers carrying passengers. Surely here was a second Captain Nemo with his electrical boat, which moved or was still, answered the helm with or against the tide with equal ease, and —who knows—even descended into the water at the will of the owner." But she did not descend. An official who demanded to see the license was run away from. The launch is 37 feet long, and has 6 feet breadth of beam, and is capable of carrying comfortably 40 persons. She ran from Westminster pier to Charing Cross pier (730 yards) in 2 minutes, and was worked up to the rate of 12½ miles an hour. She has shown an average speed of 9½ miles an hour with the tide, and 7½ miles against it, and has run 50 miles in 6 hours. It would appear from these and other tests that the Reckenzaun motor is as well adapted to marine navigation as to street-car service.

Dielectric Capacity.

Some experiments on the dielectric capacity of gases at 0° C. and 760 mm. have lately been made by Klemencic, who gives the following table. The corresponding table of refractive indices are those determined by M. Mascart:

	$\sqrt{K}$ (K = specific inductive capacity).	μ (= refractive index.)
Air	1.000293	1.0001927
Hydrogen	132	1387
Carbonic acid	492	4544
Carbonic oxide	347	5350
Protoxide of nitrogen	579	5159
Ethyline	728	7200
Sulphuret of carbon	145	1478
Sulphurous acid	477	7040
Ether	372	1537
Chlorethyl	766	1674
Bromethyl	773	1216

It can be seen that for the last four gases the square root of the specific inductive capacity is no longer comparable to the index of refraction.

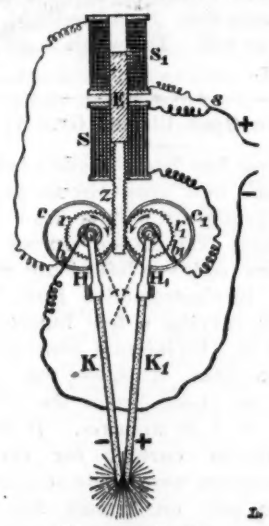
The Muthel Differential Arc Lamp.

This lamp, which is described in *Dingler's Polytechn. Journ.*, belongs to that class in which the carbons instead of being placed one above the other in the same line, are merely inclined toward each other, so that the arc is formed at the lower end and casts no shadows.

The mechanism is quite simple. The carbon holders H, H_1, are inclined toward each other, the angle being regulated by the core E of the differential solenoid S, S_1. At its lower extremity, the arc carries a rack which gears with two pinions r, r_1. The shafts of the pinions are insulated and carry the carbon-holders. In addition, the shafts carry the eccentric discs c, c_1. The weight and eccentricity of these are such as to counterbalance the core E, so as to maintain the carbons in contact.

The current is led to the shafts by means of the brushes b, b_1, and then passes through the carbons. The current, which may be either continuous or alternating, divides between the direct circuit $s\,S\,b_1\,K_1\,K\,b$ and the shunt $s\,S_1\,b$. When the carbons are in contact the action of the series coil S predominates, and draws down the core E, which separates the carbons and establishes the arc. When, after a time, the arc becomes too long by the burning away of the carbon, the shunt coil S_1 predominates and draws the core up so as to bring the carbons closer together.

The construction is such that even when the carbons have assumed the position shown in dotted outline, the core is but very little removed from its original position, so that the relative effects of the two coils S, S_1 upon the



MUTHEL LAMP.

core remain practically the same during the whole life of the carbon.

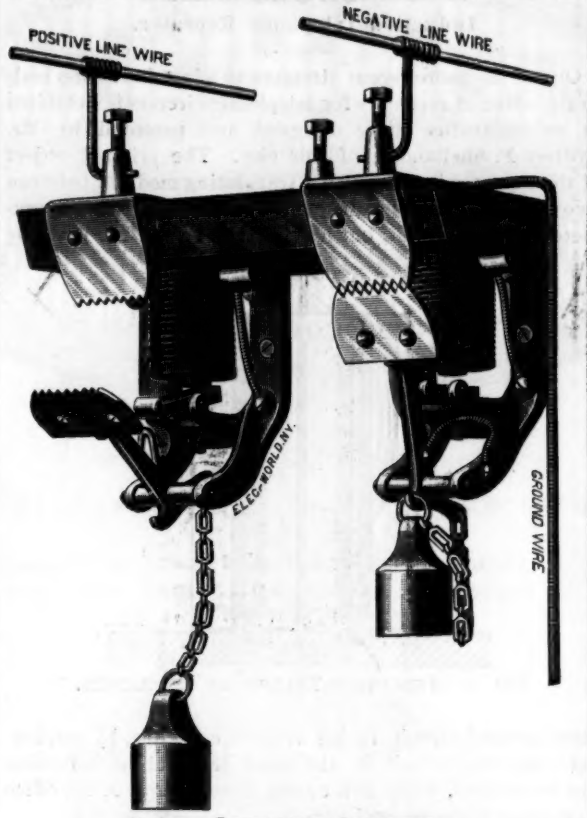
The lamp can be regulated by shifting the coils S, S_1, which are movable with relation to the core. The eccentric discs can evidently be replaced by levers with movable weights, but the above arrangement is considered preferable.

The Sperry Lightning Arrester for Dynamo Circuits.

The possibility of lightning entering electric light stations upon the circuit wires and disabling the dynamos must be guarded against in the same way as with other electric circuits which have long since been provided with suitable lightning arresters. For this purpose Mr. Elmer A. Sperry, of Chicago, has devised an ingenious apparatus which not only guards against lightning, but gives immediate indication of any dangerous ground on the circuit. The arrester in its normal position is shown in the accompanying engraving at the right hand. A static charge coming in from the line passes over the small space between the arrester plates, and in its passage to the ground passes along the arm carrying the lower jaw and the framework. To the latter is connected one terminal of the electro-magnet shown, the other terminal of which is connected with the grounded wire through the binding-post at the rear of the instrument.

A small static charge leaps the space between the jaws of the arrester passing to ground through the magnet coil, but is not of sufficient strength to magnetize the core. But upon a heavy, dangerous charge coming in, or if the circuit is grounded on the line, the core becomes sufficiently magnetized to raise the rear ends of its pivoted armature. This releases the swinging arm to which the lower jaw is attached, and the falling of the weight which is hooked to the front end of the pivot causes the lower jaw to swing forward, separating it from the upper, as shown in the cut to the left. This, of course, breaks any sparks or arc which may have been established between the teeth of the jaws.

Now it will be noticed that the forward movement es-



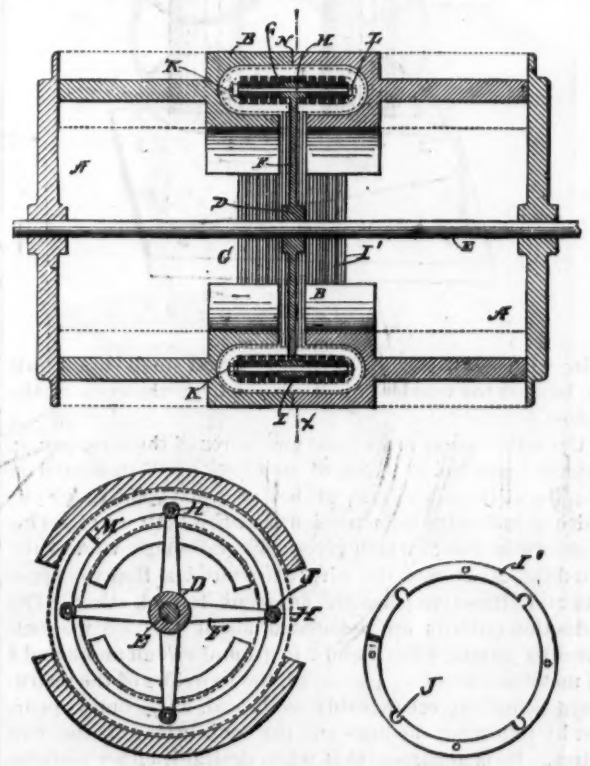
SPERRY LIGHTNING ARRESTER.

tablished allows the weight to escape from the hook. But in falling it restores the jaw to its original position by reason of the chain being attached to the opposite side of the pivoted lever, as will be readily perceived. Thus the jaws are in immediate readiness to take off another charge, and all that is required is the replacing of the weight upon the hook.

It will be noticed too that the breaking of the arc established between the jaws is caused by mechanical means, and requires no permanent current through a coil with its attendant waste. We may add that this arrester, which is being placed on the market by the Electrical Supply Company, has been in practical use for over a year with continued success.

Some Recent Modifications in Dynamos.

In a dynamo designed recently by Mr. Arthur G. Ketchum, of Winchendon, Mass., certain modifications in con-



FIGS. 1, 2, AND 3.—KETCHUM DYNAMO.

struction have been introduced, especially in relation to the armature, by which the latter can be readily put together. At the same time, the construction aims to prevent warping in the armature and to expose a maximum area to the action of the magnetic field.

Our illustration, Fig. 1, shows a longitudinal cross-section of the machine, and, as will be seen, the pole-pieces are so grooved as to embrace the whole superficial area of the armature, except the spokes and hub, the pole-pieces touching and being secured to each other at N on the outside and separated on the inside only by the thickness of the spokes F.

The armature, the construction of which is shown in detail in Figs. 2 and 3, has enlarged heads G at the outer ends of the spokes, and the holes H pass through them. The incomplete metallic rings I are provided with notches J, which fit over the heads; and other similar rings I', without notches, are interposed between the former. The bolts K pass through the rings and head and serve to bind them all together. The notched rings J serve a useful purpose here. For if they were not present, several rings midway between the ends of the armature would have to be omitted. This omission would destroy the symmetry of the armature and diminish the strength and quantity of iron in the armature. Each ring is split at M. It is found by this construction that the expansion and contraction due to heat take place in the plane of the ring, thereby preventing warping.

A modification of the same idea is shown in Fig. 4, in which several rings are fitted upon the enlarged heads and prevented from sliding off by means of bolts K' passing through the heads and through one ring I'' upon each side of the heads.

The remaining rings are secured to each other and to the former mentioned rings by bolts K''' passing through holes in all the rings.

Commencement of the Government Telephone Suit.

In accordance with an agreement the attorneys in the telephone case were given a hearing at Columbus, O., by Judges Jackson and Sage on the 9th inst. The Hon. Aaron F. Perry, representing the Ohio telephone companies, which were made party defendants in the case, asked leave to file pleas on behalf of his clients. The pleas which Mr. Perry desired to file were, that in the absence of the defendant, the Bell Telephone Company, the case cannot proceed, and that the validity of the patent has already been tested by the courts. The question of jurisdiction was also raised. The question of raising all of these pleas at once or hearing them separately was argued by Mr. J. J. Storrow, of the defense, who thought it better to raise all of them at once, since the court could then hear them in September. The Hon. R. A. Harrison and Judge Thurman both made short statements, and it was finally agreed to hear the matter. There were present the Hon. Allen G. Thurman, the Hon. Jeff Chandler, ex-Senator J. E. McDonald, the Hon. Aaron F. Perry, the Hon. J. J Storrow, and the Hon. R. A. Harrison.

Judge Thurman made a short argument in opposition to the admission of the three pleas, and claimed that the only thing the court could do was to admit the filing of a demurrer, which could be done without leave, and of a motion for leave to file pleas. The Hon. J. J. Storrow, in

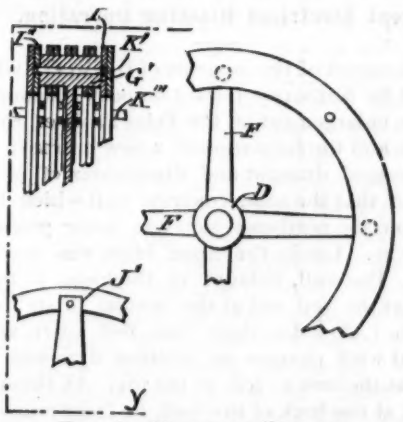


FIG. 4.—KETCHUM DYNAMO.

reply for the defense, said that the filing of these pleas would raise the whole question at once, and determine whether the Bell Telephone Company should be brought into the case immediately. The rest of Mr. Storrow's remarks were directed to the same line of argument. When he closed and Judge Thurman was about to resume Judge Jackson interrupted him by saying that the court would decide that the demurrer should be filed, and also that a motion for leave to file pleas could be filed, so that this motion could be heard on Sept. 20 at Cincinnati.

The attorneys in the case met the same afternoon in consultation, and finally agreed upon the following entry:

The United States of America vs. The American Bell Telephone Company and others in equity:

This day come the complainant, and also the following named defendants: The Central Union Telephone Company; the Erie Telephone and Telegraph Company; the Central District and Printing Telegraph Company; the Cleveland Telephone Company; the City and Suburban Telegraph Company, and the Miami Telephone Company, by their council. Whereupon the several motions of the above-named defendants for leave to file more than one plea to the bill of complaint were presented to the court, and the complainants by their counsel, objecting to the consideration of said motions at this time, and stating that if said motions shall hereafter be granted they will set said pleas down to be argued, the court orders that the above named six defendants may demur or plead, as allowed by the rules, without prejudice to said motions, and that said motions stand over and the hearing of them be postponed until the 20th day of September next.

The Financial Condition of the Western Union Company.

As was announced in these columns last week, the Western Union Telegraph Company will pay no dividend for the June quarter.

The figures furnished to the directors show that in the statement on which the scrip dividend was based the "net revenues" for the quarter ended March 31 were overestimated by $300,000. The report estimates the "net revenues" of the current quarter at $1,000,000, which is $400,000 less than the estimate for the corresponding quarter of last year, and $750,000 less than that for the corresponding quarter of 1884. It is explained in the statement that the falling off from the estimate in the net results of last quarter is due principally to the judgments against the Western Union and the Gold and Stock companies, amounting, with interest and costs, to $193,933 for taxes levied by the State of New York for 1881 on the capital stock.

"These taxes," says the report, "were paid a few days before the last estimate was made, in the confident belief that if paid we would be able to obtain an act for their refund. They were not, therefore, taken into the estimate." The report concludes thus:

"The revenues from current commercial business and news service continue to show a handsome improvement, the increase at test offices since the 1st of January being $110,000 in excess of the corresponding five months of the previous year, or an average of about $5,000 per week. But this increase is more than counterbalanced by reduced revenues from the cable and commercial news service. The low rates of tolls prevailing between commercial centres requires the handling of a largely increased volume of business to maintain the same revenues, involving increased force to handle this class of business, much of which is done without profit.

"The entire surplus, together with the sum represented by the last dividend in certificates of indebtedness, has gone into the plant, and is represented by new property, and may legally and properly be represented by capitalization either in stock or bonds, and given to the stockholders; but, under all the circumstances at the present time, it is recommended that no dividend be declared."

The figures of the report, compared with those made public in the corresponding quarter of the last three years, make the following showing:

	Quarter ended March 31 (actual).	Quarter ending June 30 (estimated).
1886	$750,846	$1,000,000
1885	1,358,876	1,400,000
1884	1,634,259	1,750,000
1883	1,677,819	1,725,000

It will be observed that the revenue is thus about half what it was three years ago.

Great Electrical Blasting Operation.

A recent account of the progress of the works which the London and St. Katharine Dock Company, commenced in 1884, for the enlargement of the Tidal Basin of the Royal Albert Dock and the formation of a new entrance suitable for the increased draught and dimensions of new ocean liners, stated that the solid concrete wall which bounded the basin on its northeast side was being prepared for blasting away. Lately the great blast was successfully performed. The wall, reduced in thickness to four feet six inches at the top and at the bottom to six feet, was pierced with 1,430 holes about four feet apart, and these were loaded with charges of gelatine dynamite varying from 8 lbs. at the base to ¼ lb. at the top. All these charges were put in at the back of the wall, its front remaining intact supporting the water of the basin. The total length of the wall was 520 feet, and the estimated weight of material, flint and pebble concrete, 7,850 tons. The electrical wiring for the simultaneous discharge of this multitude of shots was carried out by Messrs. Siemens, who have the lighting of the docks, the plan of operations having been submitted by the Dock Company to Sir Frederick Abel. One of the alternating machines used for shed lighting, and in its ordinary working giving off a current of 48 ampères at 600 volts, was coupled up in series to develop a high tension current of 24 ampères at 1,200 volts, to suit it for firing the high tension Abel fuses which were to be employed on the occasion, this being the first time that such a large number of this class of chemical fuses have been employed, platinum wire or low tension fuses being usually adopted for this kind of operation. Two well insulated main leads of copper wire were brought from the ordinary electric lighting station beyond the Galleons Basin, and were carried along the rear of the wall. Two additional mains were also carried from the machine and united with the first mains about the middle and at the end of the wall, so that if any damage or defect occurred at any point in the transmission of the current it would have independent means of percolating the network system of branches which were taken off from the mains to the fuses. The transmitting mains were tapped at the firing station, erected near the bridge, at the western extremity of the basin, by a tumbler-switch, by a blow upon which the electrical current could be instantaneously put into circuit. The total length of branch wires was over six miles, and the total quantity of gelatine dynamite employed was stated to be 2,860 pounds. Six feet of the wall was above the level of the water in the basin. The operation was performed in the most successful manner, and upon inspecting the site of the blast, it was found that the wall had completely disappeared, except half a dozen large blocks, one about four feet long, which had been thrown about twenty feet, and lay on the road. The divers at a later period reported that the material had been reduced to small masses not exceeding a ton weight, and smaller on the average.

Induction Telephone Repeater.

One of the more recent attempts to adapt induction coils to the office of repeaters for telephonic circuits is exhibited in an apparatus lately designed and patented by Mr. Sydney F. Shelbourne, of this city. The primary object of the repeater is to furnish a translating medium between two exchange offices connected by trunk lines, with complete metallic circuit, but leaving the subscriber with the

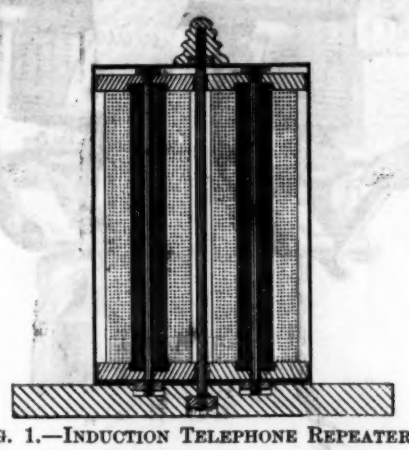


FIG. 1.—INDUCTION TELEPHONE REPEATERS.

usual ground circuit to his exchange. Thus, by employing a metallic circuit in the trunk line cables, induction can be avoided, while at the same time the rest of the office equipment remains unchanged.

The repeater, which is shown in section in Fig. 1, consists essentially of an induction coil in which great pains have been taken to make the primary coil equal in effect to the secondary, so that they can be employed indifferently, one for the other. As will be seen, Mr. Shelbourne employs two spools, each having a magnet core of its own, composed of soft iron wires filling a small paper tube of the same length as the wires. Through the central axis of the bunch of wires passes a larger and longer soft iron

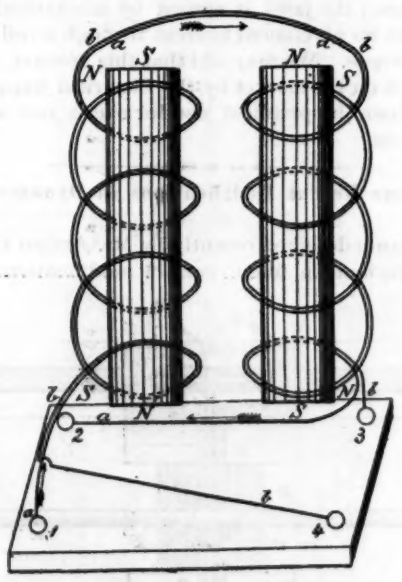


FIG. 2.

wire with screw threads at each end and small brass nuts as binders for wooden discs placed over the ends of the spools.

Upon the spools are wound two wires of the same gauge, usually from No. 32 to No. 34, and they are both wound on parallel at the same time, so that at every point in the circuit the inductive influence is alike upon both wires. This is shown in Fig. 2, which gives a diagrammatic view of the winding. As shown, the wires are wound so that the opposite and attractive poles are adjacent to each other. The induction circuits are associated about the two magnet-cores by joining posts 1 and 2 in ground circuit and 3 and 4 in metallic circuit, or *vice versa*, the two sides of the instrument being interchangeably reciprocal, as becomes apparent by following the lines and the connections of the two wires. It is apparent that when desirable either metallic or ground circuits may be used at both sides of the instrument. In order to prevent all waste of magnetic lines of force going off into space, the adjacent ends of the cores of the coils are connected by iron pole plates, and the whole is inclosed at the sides by a soft iron case.

The Blackpool Road.—Speaking of this successful line, the *Pall Mall Gazette* says: To Blackpool, the Lancashire Brighton, is due the credit of introducing to a doubting public an electric tram service, so constructed as to be of no more hindrance or danger to ordinary traffic than is the common horse tram.

Incandescent Lamp Patents.

Mr. H. R. Garden, speaking as of counsel for the Consolidated Electric Light Company, sent the following communication to the daily papers, under date of June 12, in regard to incandescent lamp patent litigation in England:

"In your paper of June 10 the following notice appeared: 'London, June 9.—Mr. Justice Butt rendered a decision to-day in the equity case of Edison against Woodhouse & Rawson in favor of the plaintiff. The action was for infringement of patent, and the effect of the decision is to guarantee to the plaintiff the exclusive use of a filament of carbon in electric lighting. The case has been on trial for nine days.'

"For the purpose of correcting an erroneous impression I have been requested to state the following facts:

"Mr. Justice Butt decided for the plaintiffs two suits for infringement styled Edison & Swan against Woodhouse & Rawson instead of one. The first on a patent granted to Mr. Edison in England for a carbon filament of high resistance; the second on a patent granted to Sawyer & Man in England (through their attorney, Mr. Cheesbrough), for the method of making the illuminating part of an incandescent electric lamp, substantially a transcript of the United States patent to Sawyer & Man for the same invention, which was purchased for England by Edison & Swan.

"In the United States the ownership of the invention of the fibrous carbon filament awaits the decision of the court in the suit for infringement instituted against the Edison Company in 1885 by the Consolidated Electric Light Company, owner of the patent which was issued to Sawyer & Man after a contest of nearly five years in the Patent Office. A patent for the fibrous filament was never applied for by Sawyer & Man in England.

"The Sawyer-Man patent for preparing the illuminating part of an electric lamp (which was sustained by the English decision) is the property in this country of the Consolidated Electric Light Company, and suit is pending upon the same against the Edison company and others for infringement."

A Novel Electric Tricycle.

Mr. N. S. Possons, superintendent of the Brush Electric Company, of Cleveland, O., has caused to be constructed and now has in successful operation a tricycle operated by an electric motor. The current is derived from a number of Brush storage batteries inclosed in a neat box of cells under the seat. The motor is of the Brush type specially made for this purpose. There is also a small Swan incandescent lamp in connection, for a headlight, which can be switched on or off at will. The whole is got up with considerable ingenuity.

Kauffer's New Open Circuit Gravity Battery.

Prof. A. E. Dolbear has lately made a test at Boston of Mr. T. L. Kauffer's new open circuit gravity battery. His report to that gentleman will be read with interest: I have made frequent examination during the past two weeks of the battery cell you left at my office with the following results. Its electromotive force was found to be above 1.5 volts, varying a few hundredths with an average of about 1.53. Its internal resistance was in the neighborhood of one ohm. This, too, was sometimes less than that, so that on short circuit the cell would give a current equal to 1.53 ampères. It was tested for its ability to furnish current for several minutes at a time and measures were made of its rate of loss of potential. When put on circuit for ten minutes through two ohms external resistance, its potential fell to 1.47 volts, and its internal resistance increased only a few hundreths of an ohm, so that at the end of that time it had lost but a little of its original power. In a few minutes it had fully recovered and could give as much current as before. I circuited it through one ohm for 16½ hours, when it was found to have been reduced to about 1 volt. In two and one-half hours it had fully recovered and had an E. M. F. of 1.53 and an internal resistance of about 1 ohm. This is a very creditable performance for an open circuit battery as you declare this to be intended for. Its E. M. F. is higher than a good Leclanché. Its internal resistance is only about one-half that of such a cell, and its persistency for such work as the Leclanché is adapted to (such as bell ringing, gas lighting and telephone work) surpasses the Leclanché.

Choice of Metals for Conductors.

M. E. Bède, lecturing recently before the Belgian Society of Electricians on the choice of metals for the wires of telegraph and telephone lines, observed that since the achievements of M. Van Rysselberghe, telegraph lines must now be considered separately from telephone lines. M. Eric Gérard, in his recent lecture before the Society at the Montefiore Electro-Technical Institute, pointed out that in accordance with Hughes' experiments in self-induction, and those which he himself had conducted at the Electro-Technical Institute, that to transmit equally for an alternating current with very short undulations, like telephone currents, iron wires must be employed of a slightly larger diameter than that of a copper or phosphor-bronze wire of high conductivity. Consequently, the weights of

the two lines in iron and in phosphor-bronze—equally good for telephonic transmission—would be in a ratio of 32 to 1, and as the price of galvanized iron wire is more than one-eighth that of the bronze, it follows that a line laid with iron wire would cost at least four times the amount of an equally good line in phosphor-bronze wire of high conductivity, without taking into consideration the fact that, being thirty-two times heavier, it would require much more costly supports and labor. From the beginning of telephone exchanges M. Bède had adopted for the wires the phosphor-bronze of M. Montefiore, and the results had always been excellent. Now, almost all the telephone companies had followed this example, and it had been found possible, with phosphor-bronze wire of great tenacity, to span whole valleys of 800 metres (875 yards) without intermediate supports. After M. Bède's lecture, M. Banneux, Inspector of the Belgian State telegraphs, declared that this Administration has decided to replace all the iron-wire lines as they became defective by those of phosphor-bronze, and had already given some large orders to M. Montefiore. M. Van Rysselberghe then declared that, judging by his experience in America, it was not possible to establish good telephonic transmission to long distances by means of iron wires, while with those of copper excellent results were obtained. It was thus that he was not able to correspond properly at a distance of 250 miles by means of iron wire of 4½ mm. diameter (No. 8), while he corresponded perfectly well from New York to Fostoria, a distance of 730 miles, with a hard copper wire of 2.7 millimetres, and from New York to Chicago (1,010 miles) with a compound wire, formed with a steel core of three millimetres, surrounded by a thickness of 1.5 mm. of copper, corresponding to a 5 mm. copper wire. It was certain that communication could be established by telephone with such a wire at 2,000 miles distance, so as to give commercially satisfactory results.

Mechanical Telephone Exchanges.

Our readers will remember that in the issue of THE ELECTRICAL WORLD of Dec. 26, 1885, we described Mr. George F. Shaver's ingenious system of mechanical telephony, which he has adopted for exchange purposes. This description created widespread interest at the time, as was evidenced by its reproduction in other papers, among them several foreign ones. At that time Mr. Shaver had experimented with his system in Jersey City, but he has recently established a station in this city for the purpose of demonstrating the practicability of his methods. This new station, however, exhibits certain modifications which considerably increase the ease with which the exchange operator can make connections, and which merit a description. As shown in our previous article, the lines entering the station were all attached to a circular rising spiral, and were attached for connection at different levels, so that cross connections would not interfere with each other.

In the present arrangement the same object is attained by more simple means, the switching apparatus being shown in the accompanying illustration. As in the old method, the line, as it enters the station, is split, one branch being attached at each hole around the bottom of the circular rack, where it is permanently fixed.

The other branch of the same line is then attached to a small block, placed directly over the lower terminal, which block slides freely up and down between the vertical rods.

All these upper terminals, when the lines are not in use, are at the same height. It is only when cross connection is made between any two that the blocks are lifted to the height of the arm shown, which carries the pulley for pulling the connecting wire taut. These arms, only one of which is shown, can be slid up and down, and thus interference between two connecting wires is avoided.

Besides this improvement there is another which facilitates the work of the operator in communicating with the subscriber. It will be remembered that, in the old arrangement, the operator's telephone was supported on a circular rail, so that it could be brought before the desired lower terminal for attachment thereto in order to establish conversation. This arrangement is here done away with, the operator now using a hand telephone. Two of these telephones are shown. These are provided at the rear with two brass strips hooked at the top so that the instrument can be hung at any point upon the circular hoop running around the interior of the framework. The diaphragm has a small length of wire attached to it which is hooked to the terminal of the line and then the operator, by gently pressing forward the handle of his telephone, creates a tension upon the diaphragm which allows him to communicate with the subscriber.

Mr. Shaver has also introduced a modification in his telephone, which consists in placing a cone at the centre so that the sound within the inclosing sounding board is deected outward. In other respects, the construction remains the same, the new instrument being shown in Fig. 2.

As before stated, an exchange of this nature is now in operation, in which a number of lines centre, varying from a few hundred feet to three-quarters of a mile in length, and the articulation, which we have had occasion to praise before, is very satisfactory. In small cities, especially where electric telephone exchanges cannot be made to pay, the mechanical telephone exchange can be used to advantage.

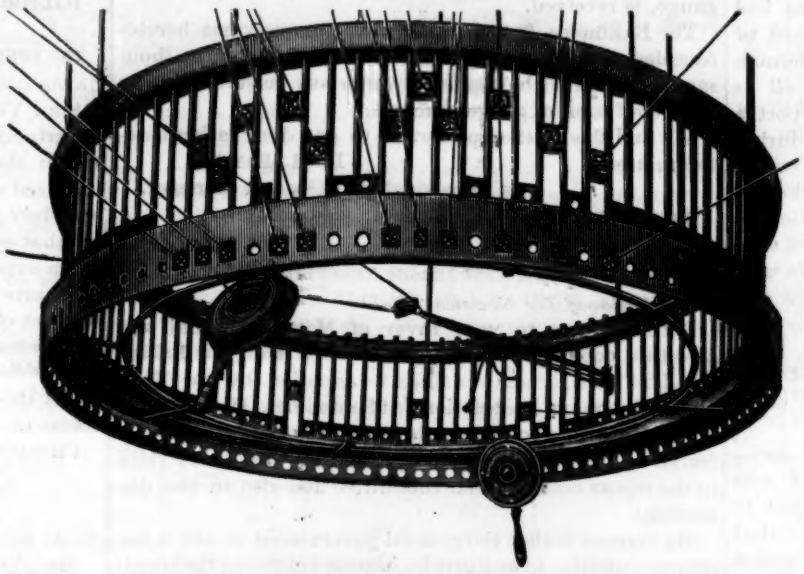


FIG. 1.—SHAVER'S MECHANICAL TELEPHONE EXCHANGE.

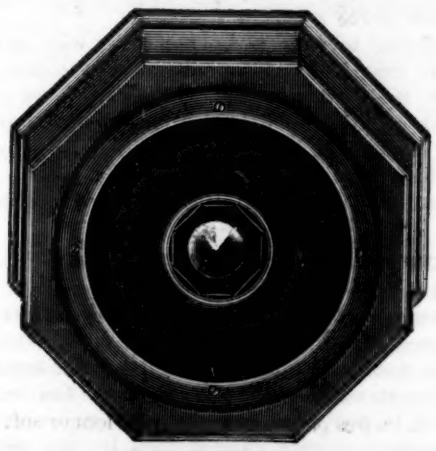
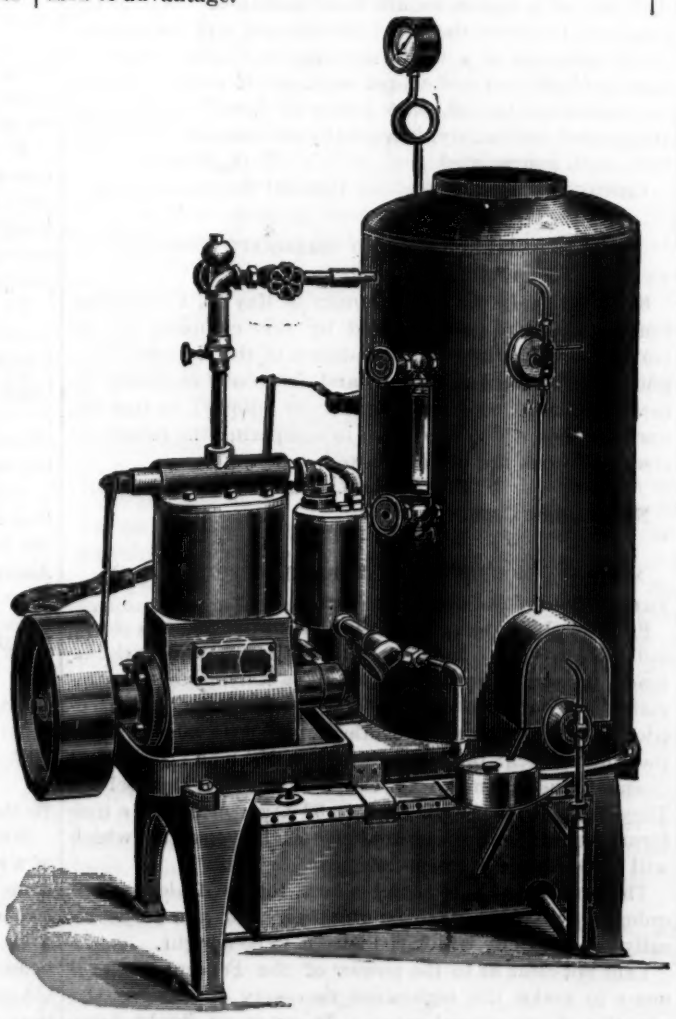


FIG. 2.—SHAVER'S MECHANICAL TELEPHONE EXCHANGE.



ENGINE FOR DOMESTIC ELECTRIC LIGHTING.

The switch rack shown in our illustration is designed to take in two hundred lines, and this ought to be ample for the wants of small places, a number of which, we understand, are about to be equipped with them. The method of operation is easily learned, and anyone of ordinary intelligence can conduct such an exchange.

A Small Steam Engine for Domestic Electric Lighting.

There is no doubt that many private dwellings would be lighted by incandescent lamps if it were more generally known that some convenient form of motor were available—one that would require a minimum of care and attention and which would operate economically so as to develope power in exact ratio as it it is called for. An attempt to provide such a motor has recently been made by the Household Electric Light Company, of Boston, which is engaged in the installation of electric lighting plants where but few lights are required. The engine is made by the Rochester Machine Tool Works, and the Household Company has exclusive agency for New England.

The motor which they employ and which is shown in the accompanying engraving is a small, single-acting steam engine having two cylinders with cranks set at 180° to each other. The fuel employed is kerosene, which is atomized by a steam jet, and its supply is contr olled by an automatic fire regulator which reduc es or cuts it off entirely when the steam pressure reaches the limit at which the regulator is adjusted. It is estimated that from 4 to 4½ gallons of oil will develop one horse-power for 10 hours. Besides this control of the fuel supply the little engine has its governor, which main tains the speed constant for varying loads. Seventy pounds of steam are carried in the boiler, which is constantly supplied with water from a small pump worked directly from the main shaft. In addition thereto a hand-pump is provided for filling the boiler when cold.

The engine, which is built in sizes up to four horse-power, evidently embracing the desired qualities for a motor intended to operate with little attention, and we may add that lubrication, an important item, has also been well provided for by inclosing the engine within a case filled with oil, so that the crank dips within it, and, by splashing, throws the oil upon all the more important moving parts. The Household Company states that the one horse-power engine will run its dynamo giving six 20 c. p. lights or eight 16 c. p. No attention is required by such a plant after starting. The small dynamo is said to be one of the most efficient of its kind in use.

Timing Bicycle Races by Electricity.

E. H. Foote of the Massachusetts Bicycle Club has submitted to President Ducker a scheme for obtaining absolutely correct timing of races, and it is so practical and ingenious that the club will put it into practice. The details are as follows:

Take a strip of rubber 2½ to 3 inches wide and $\frac{1}{16}$ inch thick, long enough to cross the track. Sew or rivet on one side of this two strips of thin sheet brass or copper. Fold the two sides of the strips together, metal strips inside, and sew together. In use fasten one end to the ground on the opposite side of the track to the judges' stand, the other end to the ground on the side next the stand. This end to be attached to a block of wood or rubber having binding screws connected with the metal strips. These screws are also connected in circuit with a battery, and a loud, single stroke-bell. The strips are kept apart at the opposite end by a wooden plug if necessary. The riders to be started with their wheels just in contact with the strips. Whenever there is pressure enough put on the rubber to place the metal strips in contact, the bell will sound. The starting time to be taken at the first stroke of the bell when the first man crosses, as there would be a slight variation in the men getting away, and the rear wheels would also cause a stroke. The time of finish to be also taken by stroke of the bell. The time between the strokes of the bell would be absolutely correct, and could probably be taken more accurately than by the eye. This system could be extended by puting in the battery circuit a recording instrument which would automatically and accurately record on paper each and every time, however many men there might be in the race. This would necessitate quite an additional expense, as the recorder would have to be actuated by an accurate time-piece.

Irregular Action of Galvanic Batteries.

Experiments have been made on the cause of irregularities in the action of galvanic batteries by H. V. Hayes and J. Trowbridge—*American Journal of Science*—by means of an apparatus for photographing the deflections of a galvanometer needle. The authors tested a number of batteries, all variations of current being accurately registered. Irregularities were found to be caused by two separate actions, a diminution in the current strength, caused by the pores of the partition becoming filled with the base; and secondly, a diminution of the acid at the positive pole. Both these difficulties are overcome by making a partition of as large surface dimensions as possible, and by using very porous material.

An International Standard Wire Gauge.

In 1884 the National Telephone Exchange Association appointed a special committee composed of Messrs. W. D. Sargent, D. I. Carson and T. Doolittle on the subject of wire gauges. This committee, at the annual meeting at Providence in 1885, presented a majority report favoring the adoption of the new English standard gauge that had been legalized through the intervention of the Board of Trade, and had in a sense become international, German and French manufacturers and consumers, as well as English, using it. On the presentation of the report a very lively and interesting discussion ensued, during which Mr. Doolittle advocated the retention of the American gauge. Finally, upon motion of Mr. Sargent, the following was adopted: "*Resolved*, That this Association, so far as they can, will adopt the English standard wire gauge for their future work." Instructions were also given to the Secretary to issue a table of the gauge and to communicate with other electrical bodies on the subject. In accordance with the wish thus expressed, General Barney published valuable tables of the old and new gauges, and entered into correspondence with the other electrical organizations of the country.

At the meeting of the National Electric Light Association at Baltimore, in February last, the subject was brought up, when the new gauge was adopted, subject to enlargement in order to include the heaviest wires that might be required for lighting and power. This action was stated as being taken "for the purpose of securing uniformity in the mutual understanding of orders between manufacturers, dealers and consumers of wire" in electrical work. Associate members making or selling wire were "requested to incorporate into their catalogues and price-lists the stipulation that the standard gauge approved by the above Association be understood as applying to all orders, unless otherwise specified, either in quoting prices or shipment." Moreover, the committee reporting was continued to confer with other associations similarly situated "with a view to the legalizing by Congress of such standard gauge for guidance in the preparation and enforcement of contracts."

The matter was again taken up at the annual meeting of the American Institute of Electrical Engineers in May last. The Institute discussed it at length, but, while evidently in favor of the new gauge, did not proceed to final action, referring the question instead to the council. Very little information was obtainable as to the general practice in ordering and making wire. The council of the Institute at a meeting held on the 8th inst., appointed a committee to consider the subject, and there, for the present, its action rests.

In order that fuller information should be had on a matter so important, a letter was recently addressed from the office of THE ELECTRICAL WORLD to the principal makers and users of wire throughout the country, calling attention to the facts above recited, and asking two questions as follows:

1. What is your practice in ordering or manufacturing wire?

2. Would you recommend Federal or State legislation enforcing the "standard" gauge in contracts?

From the answers received thus far, and given in full below, it would appear that the gauge has not yet been generally used in practical work, and that the prospects of its early universal adoption are not specially bright.

WESTERN UNION TELEGRAPH COMPANY.

To the Editor of The Electrical World:

SIR: Replying to your favor of May 24, relative to wire gauges, I believe considerable advantage would result if some one gauge could be made generally acceptable and adopted in practice. The many lengthy discussions on the subject, however, indicate how difficult it is to satisfy everybody.

As for the new British gauge, my own observations do not show such a general use of it here as would make it American or international. At the same time, it has received considerable support, and indications are not wanting to mark it as one on which most users would unite for the sake of uniformity. I should favor it on that ground, but would hardly recommend state or national legislation on the subject, for the present, at least.

The practice with the Western Union Company for several years past has been to specify the number of "pounds per mile" for the different sizes of wire used.* I apprehend that this, or a similar one of specifying by diameters, will be continued by many, for special work, even should a so-called standard gauge be adopted.

NEW YORK CITY. G. A. HAMILTON.

* Abstract from W. U. form of specification for galvanized iron telegraph wire:

4. The weight per mile for the different gauge wires to be: for No. 4, 730 lbs.; No. 6, 540 lbs.; No. 8, 380 lbs.; No. 9, 320 lbs.; No. 10, 250 lbs., or as near these figures as practicable.

5. The electrical resistance of the wire in ohms per mile, at a temperature of 68 Fahrenheit, must not exceed the quotient arising from the dividing the constant number 5,000 by the weight of the wire in pounds per mile. As examples: The mileage resistances of a wire weighing 730 lbs. per mile (No. 4) should not exceed $5,000 \div 730 = 6.85$ ohms; that of one weighing 540 lbs. per mile (No. 6) should not exceed $5,000 \div 540 = 9.26$ ohms; that of one weighing 380 lbs. per mile (No. 8) should not exceed $5,000 \div 380 = 13.16$ ohms, and that of one weighing 320 lbs. per mile (No. 9) should not exceed $5,000 \div 320 = 15.625$ ohms. The coefficient .003 will be allowed for each degree Fahrenheit in reducing to standard temperature.

BALTIMORE & OHIO TELEGRAPH COMPANY.

To the Editor of The Electrical World:

SIR: Yours of May 24, relating to the standard wire gauge, is received.

The Baltimore & Ohio Telegraph Company has heretofore designated a desired wire by its diameter in thousandths of an inch, which prevents any mistake arising from confusion of gauge numbers.

We find this method preferable to any designation heretofore used. D. H. BATES,

President and General Manager.

NEW YORK CITY.

THE NEW YORK & NEW JERSEY TELEPHONE COMPANY.

To the Editor of The Electrical World:

SIR: Replying to your favor of May 24, I would say that this company is using and has been using the British standard wire gauge ever since its adoption by the Telephone Exchange Association last September. Having been a member of the committee to whom the subject was referred by the Association, I expressed my views very fully in the report made by that committee and also in the discussion.

My opinion is that the general government would be the proper authority to institute legislation enforcing the standard gauge in contracts. It is a national question, not a local one. W. D. SARGENT, Gen. Manager.

BROOKLYN, N. Y.

WISCONSIN TELEPHONE COMPANY.

To the Editor of The Electrical World:

SIR: Replying to your favor regarding wire gauge, I would state that it has been our practice to order wire entirely by the B. & S. gauge. In ordering, we always mention the gauge. Up to this time we have failed to adopt the new gauge. Since its adoption, however, our purchases have been limited to probably 500 miles.

MILWAUKEE, Wis. A. S. HIBBARD, Superintendent.

CENTRAL UNION TELEPHONE COMPANY.

To the Editor of The Electrical World:

SIR: Your favor of the 24th ult., asking what our practice has been in ordering or manufacturing wire, and whether we would recommend Federal or State legislation enforcing the standard gauge in contracts, has been received, and in reply we have to say that, owing to the various number of wire gauges used by the different manufacturers, we have found it necessary in all cases to either specify the gauge or the number of pounds per mile under which the order is given. We have always exercised this precaution, and have never experienced any difficulty of a serious nature from mistakes. We do appreciate, however, the great advantages and importance of the adoption of a uniform gauge, the same gauge to apply to both iron and copper wire, and if proper Federal legislation can be had, with a view to firmly establishing the desired uniformity, it would by all means be desirable, and much appreciated. F. G. BEACH,

CHICAGO, Ill. General Superintendent.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

To the Editor of The Electrical World:

SIR: In reply to your inquiry of May 24, I would say that the standard gauge is used by this company in accordance with the recommendation of the National Telephone Exchange Association, and it would certainly be most desirable to have it generally adopted, so that the uncertainties which now exist in comparing the results of electrical work might be removed.

ED. J. HALL, JR., General Manager.

NEW YORK CITY.

MR. J. F. MORRISON, SOUTHERN ELECTRIC COMPANY.

To the Editor of The Electrical World:

SIR: Replying to yours of May 24, in relation to a standard wire gauge, I don't see how such a gauge could be made universal until adopted by a convention of wire-makers. The Telephone Exchange Association, the Electric Light Association and others who are interested in these matters can only suggest and recommend; the radical change must be made by the wire-makers themselves. They can go to work and, within 30 days, establish a uniform gauge for the wire-makers of this country which will be accepted by the users.

The practice has been, and is now, for the dealers, when ordering wire from the manufacturers, to name specifically the gauge by which the wire is to be bought.

I am not clear as to the power of the Federal Government to make the legislation necessary to enforce the adoption of any special gauge. There is no doubt, however, of the power of the state legislatures to do so; but, by the time you would get through with the different state legislatures throughout this country and establish a standard gauge, it would not make much difference to us whether there was any gauge at all or not.

The importance of a uniform standard gauge to men in our business cannot be over-estimated, but can only be understood by those actually in the business, and they compose a very small part of the population of the United States, not sufficient, in my judgment, to excite state legislation throughout the various States; therefore, unless the wire manufacturers take some steps themselves in this direction, I think it would be a very long road and a weary one to the accomplishment of our wishes.

BALTIMORE, Md. J. F. MORRISON.

THE SPERRY ELECTRIC LIGHT, MOTOR AND CAR BRAKE CO.

To the Editor of The Electrical World:

SIR: Your kindness of May 24, in regard to the great uncertainty existing in electrical circles as to the extent to which the new British wire gauge, the Board of Trade legalized standard gauge, has been adopted in this country, was duly received, and in reply would say: it seems to me that some standard legalized gauge should be adopted. From experience with the various gauges I think Brown & Sharpe's American gauge is certainly equal to any; the fact of its size being determined according to a known law seems greatly in its favor, to my mind; and the fact of the resistance and various functions of wire manufactured under this gauge having been accurately determined, it seems to me to be the one that should be adopted.

CHICAGO, Ill. ELMER A. SPERRY.

THE BRUSH ELECTRIC COMPANY.

To the Editor of The Electrical World:

SIR: Your favor of May 24 is duly received. We have been accustomed to use the Birmingham wire gauge standard in all our outside work. We believe the new Board of Trade legalized standard gauge differs but little from the ordinary English gauge, but in these few points of difference has an advantage. We would, therefore, be in favor of the adoption of this gauge, and would be glad to see some movements looking toward its being made an accepted standard. We do not, however, consider the question a vital one.

We would state that in all manufacturing work we do not go by any standard gauge of wire, but go by thousandths of an inch, and have our wire all made to order, under contract. THE BRUSH ELECTRIC COMPANY,

CLEVELAND, O. J. POTTER, Treasurer.

JENNEY ELECTRIC COMPANY OF INDIANAPOLIS.

To the Editor of The Electrical World:

SIR: Replying to yours of May 24, we think every method should be employed to promptly enforce the standard gauge. The confusion arising from the numerous gauges now in use is most annoying. We would favor the enforcement of uniformity by legislation so far as practicable.

Our custom in ordering wire, where we are at all particular, is to use decimals.

JENNEY ELECTRIC COMPANY,

INDIANAPOLIS, Ind. BRAINARD RORISON, Sec'y.

KANSAS CITY ELECTRIC LIGHT COMPANY.

To the Editor of The Electrical World:

SIR: Replying to yours of recent date, I would say that we use the Brown & Sharpe gauge.

A universal system of wire gauging is, for obvious reasons, greatly to be desired. It is said, however, that the only way to secure one is for all nations to adopt that of England. English obstinacy, 'tis true, has become proverbial; but English intelligence deserves a higher compliment than is conveyed by such servile conformity.

To the telegraph and telephone interests, the mathematical accuracy and symmetry of a wire-measuring system is of comparatively little moment; but to the electric light fraternity it is of the utmost importance. From the well-known commercial advantages of the metric system of weights and measures, many have concluded that nothing will do except a decimal basis upon which to construct a wire gauge. They seem to have overlooked the fact that the former deals chiefly with simple arithmetic, and the latter with ratio and the higher mathematics. The American gauge is formed upon a better principle, and, therefore, has my preference. But I would recommend the appointment of an international commission to select or devise a system which will meet the requirements of all. Federal legislation will then be the proper measure.

KANSAS CITY, Mo. E. R. WEEKS.

THE WATERHOUSE ELECTRIC AND MANUFACTURING COMPANY.

To the Editor of the Electrical World:

SIR: We recognize the great importance of the subject of a standard wire gauge and heartily indorse and welcome its adoption.

We think habit and ignorance on the part of manufacturers of what is the new standard, with possibly an expense in a change of tools, continues the demand for the old gauge. While the subject might be helped by legislation, we think a combined effort of wire manufacturers and makers of wire gauges would hasten the result. Let the manufacturers of wire print only in their catalogues tables of the new standard, and in a very short time the old will be forgotten.

Should there be a wail on account of it, they could have a private table for such, with the announcement that wire made in sizes of the old gauge would be charged at 1 cent

advance of prices of new gauge; then could follow a little sermon on the great advantages of one standard size. We predict the penny and the sermon would bring them into line and smooth the ruffled feathers.

The pipe thread men are demanding a standard, which must be a great necessity with them, and some ten years since a well-known firm (the Pratt & Whitney Company) of our city, recognizing the necessity and importance of a standard size, spent many thousands in getting ready, producing gauges in duplicate, reserving one set for occasional comparison and correction of their working gauges, and they are to-day able to reproduce plugs and templates conforming exactly in size with what may have been heretofore furnished a manufacturer. Their efforts have been appreciated by manufacturers.

We do not doubt, in time soon to come, the universal adoption of an international wire gauge, and we will do what we can, as users of wire, by ordering our wire in sizes of the new standard gauge.

THE WATERHOUSE ELECTRIC AND MFG CO.,
HARTFORD, Conn. CHAS. E. CHAPIN, Secy.

THE WESTINGHOUSE ELECTRIC COMPANY.

To the Editor of The Electrical World:

SIR: Replying to yours of May 24, about gauges, I would say that it is our practice to give diameter of wire in thousandths of an inch, and to allow a margin of one thousandth over or under the dimension required. While we generally order a diameter that matches with B. & S. gauge, we very frequently require special sizes, and find that when orders are given in sufficient amounts, this in no wise tends to increase the order. While we acknowledge the utility of a standard gauge, we cannot conceive any use whatever for Federal or State legislation to enforce the use of any particular gauge. G. PANTALEONI.

PITTSBURGH, Pa.

AMERICAN ELECTRICAL WORKS.

To the Editor of the Electrical World:

SIR: Your favor received. In reply, we would say that since the adoption of the new British standard gauge by the National Telephone Exchange Association last September, we have had but one order for wire wherein this gauge was used, and that instance occurred within the last two weeks. With this exception, no reference has been made to it in any correspondence connected with our business. It would seem as though no attempt had been made to recognize it in business transactions. The Brown & Sharpe or American gauge is most generally used by our customers in ordering wire, and in a great many cases the size is designated by thousandths of an inch. All of the fine wire manufactured by us is marked and identified by its diameter in thousandths of an inch. For instance, No. 36 Brown & Sharpe gauge wire, which is .005 diameter, is called simply 5. We find this the most satisfactory for our work, as the use of any table of diameters and corresponding numbers is unnecessary. It has an advantage not possessed by any other method, that of identifying odd sizes: for instance, a wire .00525 diameter is called No. 5¼. No gauge in use has a number corresponding to this size, and hence it could not be otherwise identified. A majority of the coarse wire purchased by us is ordered in thousanths of an inch: otherwise, by Brown & Sharpe gauge, as this gauge is used by wire manufacturers generally. Our present trouble is the failure of our customers to mention the particular gauge used by them, leaving it a matter of conjecture with us. We will be satisfied with the adoption of any gauge that may be universally recognized, but as it stands at present, the adoption and non-recognition of the new gauge only increases the difficulties with which we are obliged to contend. We have no suggestions to offer in regard to legislation in the matter.

AMERICAN ELECTRICAL WORKS.

PROVIDENCE, R. I.

TATHAM & BROTHERS.

To the Editor of The Electrical World:

SIR: We have your circular letter of May 29, about wire gauges.

We make no wire at present. In ordering wire, we feel obliged to specify the *gauge*, the *number* and the *diameter* in decimals of an inch.

It would be a comfort if there were but one gauge in use, and we would be in favor of adopting the British legal standard. TATHAM & BROTHERS.

PHILADELPHIA, Pa.

NEW YORK INSULATED WIRE COMPANY.

To the Editor of The Electrical World:

SIR: Replying to your favor of May 29, would say that we use Birmingham wire gauge.

We would concur in almost any arrangement that would guarantee a universal gauge.

NEW YORK INSULATED WIRE COMPANY,
BOSTON, Mass. W. B. DOWSE, Treas.

DETROIT ELECTRICAL WORKS.

To the Editor of The Electrical World:

SIR: In reply to your favor of May 29, in reference to standard wire gauge, we are of the opinion that legislation for enforcing a standard gauge in contracts would prove futile, and would not compass the end sought. We think that the remedy lies with the wire-drawers. If they would adopt a standard, dealers and consumers would fall into line. It is our custom in ordering wire to specify the gauge required, and in every case where this is done trouble is avoided. We are disposed, however, to look with favor upon anything that is done to obtain a nationalization of a standard gauge.

WM. H. MCKINLOCK, Secretary.

DETROIT, Mich.

WESTERN ELECTRIC COMPANY.

To the Editor of The Electrical World:

SIR: Your favor of May 24 is at hand and contents noted. It is our custom in making up insulated wires to conform to the requirements of our customers. So far, more of our customers continue to use the Brown & Sharpe gauge than have adopted the new standard gauge.

We notice a growing tendency among the users of electrical wires to designate the size by the diameter in thousandths of an inch. We think this practice is to be commended, as it leaves room for no doubt as to the size required.

Under the present circumstances, we believe that state legislation on the subject would not be wise.

WESTERN ELECTRIC COMPANY,
CHICAGO, Ill. C. A. BROWN.

AUSTIN G. DAY (KERITE).

To the Editor of The Electrical World:

SIR: Replying to yours of May 24, I beg to state that our new price list and catalogue for use by telephone, telegraph and electric light companies, will be made up of the standard gauge. In regard to ordering wire, my custom is, owing to the confusion in gauges to order by thousandths of an inch, discarding gauge numbers altogether.

There would be no necessity for so doing if there were one standard gauge, and for that reason I would be in favor of, and advocate federal (not state) legislation upon the matter, making the "Standard" gauge, the standard, not only in name but in fact. CLARK B. HOTCHKISS,

NEW YORK CITY, Gen. Agt.

E. S. GREELEY & CO.

To the Editor of the Electrical World:

SIR: In reply to your esteemed favor of May 24, we beg to say that we have not yet supplied any wires specified by the standard English gauge. That gauge seems to be as yet unknown to the trade in this country. All our inquiries are either by the American or Birmingham gauge, and as the different wire-makers in this country draw by these two gauges, we presume that it would require federal or state legislation enforcing the standard English gauge to induce the manufacturers to change from their regular trade gauges.

On general principles, as it seems to be the disposition of the average American citizen to ape anything that is English, it is possible that in the near future this standard English gauge may loom up to plague the manufacturers here. Probably the best way out of the perplexities arising from the multitude of wire gauges would be to abandon all of them in toto, and draw all wires by thousandths and ten thousandths of an inch in diameter.

We certainly would not recommend federal or state legislation enforcing the standard English gauge. If we should recommend anything in this direction, it would be that all the English gauges be tabooed in this country, and that all wires be drawn by the American wire gauge, which seems to be the most sensible gauge yet put forward. E. S. GREELEY & CO.,

NEW YORK CITY. Per M. W. GOODYEAR.

HOLMES, BOOTH & HAYDENS.

To the Editor of the Electrical World:

SIR: We have your favor of May 24, in regard to gauges, and in reply would say that, as far as we know, the new British gauge has not been adopted by anybody. We have never received an order that called for wire to be made by that gauge, and it is our opinion that the approval or non-approval of any particular gauge by any association of whatever name will have but very little effect in practical work; we would not recommend federal or state legislation on the subject, feeling that any action in that direction would amount to nothing.

We would, however, be very glad to receive all orders by one certain gauge, let it be by the new British, American or any other, for, as it is now, we are obliged to keep electrical wire in stock by both Birmingham and Brown & Sharpe's gauges, thereby employing capital uselessly, and often causing mistakes, delays and other annoyances.

Of the importance of uniformity there is no doubt, but we think it will be a very difficult matter to straighten out.

Anything that we can do to help the movement will be cheerfully accorded. HOLMES, BOOTH & HAYDENS,

NEW YORK CITY. By H. C. ADAMS, Agent.

CAPTAIN MICHAELIS, UNITED STATES ORDNANCE DEPARTMENT.

To the Editor of The Electrical World:

SIR: I must apologize for not sooner acknowledging the receipt of your communication of May 24, relative to wire gauges, but a press of work compelled me to neglect all personal correspondence.

Regarding standard gauges, "that way madness lies." The matter was discussed at the May meeting of the Institute of Electrical Engineers, but was finally referred to the Council for further investigation and action. The Council meets on the 8th inst., and I presume further steps will then be taken, of which no doubt you will be apprised. The micrometer calipers is in a certain way the best wire gauge, giving us diameters, probably correct to adjacent mils. Yet even here we have uncertainty. Who can assure the uniformity of width of division lines? And will it pay to have the "personal equation" of every measuring screw determined?

The gauge is still a practical necessity for determining promptly and simply whether or not a certain wire or sheet will answer a given purpose. And as it is really impractical to make a "handy" gauge covering all thousandths of an inch, we must have one that will determine, within limits, the usual thousandths. "Under which King, Bezonian?" I fear the two influential associations you mention have acted rather hastily in adopting the new British gauge.

All interested in the matter should consider it carefully, come to an agreement, and ask government to adopt the gauge selected as the United States standard. I stated my objection to the new British gauge at the May meeting of the Institute, and it appeared to impress others with the idea that "there was something in it." As to your questions—our practice here is to order all wire by the B. W. G. In the cheaper grades, we really get the nearest corresponding manufacturers' number. I think no legislation will be required to make a given gauge "government" standard. The Secretaries of the Treasury, War, Navy and Interior Departments could make its use by their subordinates compulsory, and this action would assure the desired result. O. E. MICHAELIS.

WATERVLIET ARSENAL, West Troy.

Electrical Gas-Lighting Litigation.

To the Editor of the Electrical World:

SIR: In your issue of June 12, under the heading of Electrical Gas-Lighting Litigation, you state:

"In the case of the suits brought by the Electric Gas-Lighting Company, of Boston, against Mr. A. L. Bogart, of this city, affecting the control of what is known generally to the electrical trade as 'hand-lighting burners,' Judge Wallace granted a decree on the 29th of May."

You then give the substance of the decree, viz.: That the judge declared the patent of Sandford invalid, and that further it was decreed that Mr. Bogart does not infringe either the Tirrell or Pitt patents. You close the article with the following words:

"*The decision is understood to leave the matter practically as it stood before the suits began.*" (The italics are mine.)

As this uncalled for and incorrect summary on your part may work me serious injury in my business unless contradicted, I request that you publish the following facts:

The Electrical Gas Lighting Company have claimed to control the trade in such burners, by virtue of the patents referred to in the decision and upon which they brought suit against me to test the same. I, on my part, have, and do still make claims, to a monopoly to the trade in the same burners on account of other patents of my own (I having previously received decrees in my favor as to their validity), and set up the same in my answer.

As a result of this suit, brought to test the fact as to whether the said patents cited in complaint gave a control of the business to the the Electrical Gas Lighting Com pany or not, a decree has been rendered against the company on every count.

In the matter of "ratchet burners," the court decides that the Sandford patent belonging to complainant is invalid, on account of the Packard patent (owned by me) having the priority.

In the matter of the claim of the Pitt patent to a combination of gas stop-cock and igniting finger, or movable electrode for lighting and turning on the gas by the one motion of the cock, the court decides that this claim is ante-dated by the patent of Heyl & Diehl, also my property.

As to the third patent (the Tirrell) set up by the complainants, the Court states that it has no bearing on the case, and therefore is no infringement.

This decision, instead of leaving "the matter practically as it stood before the suits began," most positively asserts that the Electrical Gas Lighting Company can exercise no control on account of either of the patents cited by them over such hand-lighting burners, and as such decision was arrived at and based upon patents owned by me, makes a *prima facie* case as to the correctness of my claims to the monopoly. A. L. BOGART.

NEW YORK CITY, June 14.

Lowell, Mass.—Sawyer-Man lamps have been introduced for store and house lighting with great success. The electric light company has an electric power plant under consideration. Lowell is a good field in which to furnish power to a large number of small users.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, June 14, 1886.

Through the kindness of Mr. H. M. Curtis, the New York agent for the Thomson-Houston arc and incandescent systems and the Sawyer-Man incandescent system, I was enabled last week to see the bloody battle of Vicksburg fought over again, with the aid of the electric light, at Fifty-fifth street and Seventh avenue, where Mr. Curtis has introduced both forms of electric light. The exhibition building is circular, and around its inner wall is a grand cycloramic painting of the memorable fight. One stands on a central raised platform to view the scene. Over the platform is a shade awning, along the edges of which are 21 arc lamps with broad reflectors, casting the light directly on the painting. The effect is most admirable, and the disposition of the lights does great credit to Mr. Curtis. Outside are six more arc lamps, and in the entrance and passages are 25 incandescents run from 5 distribution boxes. The whole of the service is done from one 30-arc light machine run by a Lidgerwood engine. After leaving the cyclorama I went with Mr. Curtis into the big summer garden, corner Fifty-ninth street and Eighth avenue, where beneath the bright but cool light of 20 Thomson-Houston arc lamps, the people sit and enjoy themselves.

Calling upon Messrs. Hine & Robertson, 12 Cortlandt street, I was shown how sensitive and humanly delicate Kellam's damper regulator is in performing its work. The firm take steam from the pipes in the street, and from a damper regulator in connection therewith have suspended a 10-pound weight, which is very perceptibly raised or lowered upon a variation of 1 pound of steam. The Edison people, the Citizen's Company of Brooklyn, the Westinghouse Company and others are using this regulator with marked success and with economy of fuel.

Mr. Henry Muller, Jr., 670 Hudson street, has been supplying himself with all the latest machines for the manufacture of carbon plates in all sizes and styles. He keeps these goods in stock and supplies the leading battery manufacturers of this and other cities, undertaking to produce carbons of the most difficult design.

I paid a visit a day or two ago to Mr. J. S. Watt, the manufacturer of district telegraph cases and electric light hoods and shades, 81 Fulton street, and found him busy supplying the demands for his standards cases and hoods, which he has every facility for turning out in any quantity at short notice. Special designs and styles can also be had promptly to order.

The Okonite Company has put in Chicago the largest cable I know of. It contains 91 conductors, No. 14 wire. Mr. George A. Hamilton, of the Western Union Company, the purchaser, says that it measures an insulation resistance, on an average, of 3,000 megohms per mile; in some cases, 5,000. The company has put in 1¼ miles of this size and 3 miles of 61 conductor. To cover and protect the splices in the wires, which run underground, 14 copper bulbs have been used. The bulbs are about 6 inches in diameter. Each contains a hard rubber disc with holes through it for the splices to rest in. When the work is done, the copper bulb is sealed up watertight, so as to obviate any difficulty from weak connections. Mr. Jean A. Wetmore, of the Okonite Company, says that its insulated wires have undergone the most severe tests in breweries, soap factories and refineries. The Brush people are using these wires in their station at Cleveland and for lighting beyond the river, the wires running under water.

The "C & C" Electric Motor Company is pushing its motor for sewing machine purposes. I have seen the motor run a "New Home" machine with great success off two cells of bichromate solution, using 1 zinc plate surrounded by 12 small carbon sticks in each cell. The motor starts itself the instant the elements are put together. The same apparatus is also being offered for running fans, dental lathes, etc.

W. H. Guion & Co., 39 Broadway, have an "Inventors' Exchange" as one branch of their business. The object of the Exchange is to push inventions of merit, clearly covered by patent and not infringing other devices. The firm represent several well-known inventions, and have a good many now on exhibition.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Mass., June 14, 1886.

The New England branch of the Sprague Electric Railway and Motor Company has already run its wires for the transmission of power to various points in the business district, and is supplying a large number of customers satisfactorily.

Messrs. Riley & Gray, of this city, manufacturers of Howard & Bullough's patent electric stop-motion drawing frames, are undoubtedly doing a satisfactory business in this line. The firm report being in daily receipt of orders for their device from cotton mills throughout the country.

During the past week Senator Leland Stanford, of California, has inspected several of the educational institutions of this city. One day, in company with General Francis A. Walker, president of the Institute of Technology, he inspected the Institute, and had a long conference with General Walker in regard to introducing, at an institution which he proposes to establish in the West, a number of departments similar to those here.

The Synchronous Time Company, having offices in the *Herald* building, this city, is rapidly getting its facilities into shape for the manufacture of its wonderful and invaluable apparatus. The sample time-pieces on exhibition at its offices have attracted much attention and favorable comment from many expert electricians and clock manufacturers. The officers of the company are making arrangements for the simultaneous opening of branch offices on July 1 in Worcester, Lowell and other large cities and towns in this State. Each branch will be equipped with a full and varied line of the synchronous time apparatus.

The Leatheroid Novelty Company, with offices at No. 74 Bedford street, Boston, manufactures a line of goods from the material called "Leatheroid." It is said to be the best substitute for hard rubber for all electric insulating and mechanical purposes, and is alleged to cost less than any other insulating material of its class. It is further claimed that it is a perfect insulator and non-conductor, and has withstood many severe electrical tests satisfactorily. It consists of a fibre reduced to a pulp, and subjected to a powerful chemical treatment. Leatheroid is specially adapted for numerous purposes in every department of electricity, and is certain to come into brisk and general demand when its good features are better known and fully appreciated. It can be applied to dynamos, commutators, lamps, switches, switch-boards, telegraph instrument bases, backs of call-boxes, telephone-cases, batteries, magnet-heads, plugs, wall insulators, push-buttons, electric gas lighting appliances, electric fire and burglar alarms and all other apparatus of like nature. Its weight, bulk for bulk, is said to be less than any other like insulating material similarly employed, while its cost compares not less favorably.

The Municipal Signal Company, of this city, has demonstrated the merits and usefulness of its system by the satisfactory working of same during the past two weeks in South Boston, where it has been in constant use under the supervision of the police officials.

The Boston *Herald*, June 3d, in a portion of its illustrated article devoted to the Municipal Signal Company's system, says: The main feature of this system, in which it radically differs from the others, consists in the fact that the alarm and on-duty signals are received on separate recording instruments, and, while no alarm is given for the latter, the alarm signals arrive distinctly and without any mistake as to their character. The Wilson system comprises a system of communication between the central office or station and all parts of the district embraced in its care and control. It consists simply of a box provided with the desired mechanism, as will hereafter be described, placed on the street and electrically connected with two automatic registering instruments, in some respect like those used in brokers' offices to register stock quotations, and also with a telephone instrument in the office. The outside signal box, which is connected by wire with the police station of the precinct, is 18 inches high, 12 inches wide and 5 inches deep. It is of iron, and resembles an ordinary fire-alarm box. On the inside it contains the telephone instrument and the actuating mechanism for signaling, which is simple, ingenious, direct acting, and, therefore, not liable to get out of order. The connections with the office are by metallic circuit, the batteries used being located at the office, where they can be attended to and kept in order. The telephone in the box is of the old Bell magneto pattern, and is both a transmitter and a receiver of messages. At the office in the station, however, an ordinary transmitter is employed, as well as a receiver. Another peculiarity of the Wilson system is that, while there is only one metallic wire circuit, there are in practice four distinct circuits. In other words, four things can be done on the same wire at the same time, viz.: Signaling from the boxes to the stations, or vice versa; telephoning between the boxes and stations, or vice versa; the sending in of on-duty signals by patrolmen, and the transmission of alarm signals. The signaling, telephoning and on-duty signals are transmitted simultaneously by means of a difference of tension in the current, brought about by a simple form of electrical adjustment in the instruments used while the alarm is produced by breaking the current. One general battery current only is used.

Recently the lower floor and basement of the Adams House were wired for electric lighting, and during the past five weeks incandescent lamps have supplanted gas jets in the parlors, dining-rooms, cafés, billiard-rooms, rotundas and office. The central station of the Edison Electric Illuminating Company has furnished the lights. So well pleased is the hotel proprietor that the order has been given to wire the building from cellar to dome for incandescent electric lighting; and by July 1st every hall and room will be supplied with Edison lamps.

The Thomson-Houston Electric Company reports a steady and continued demand for the installation of both arc and incandescent plants on its system. As evidence of the truth of this statement, the following list of plants installed by this company since May 1st, 1886, was handed me to-day: At Charlotte, N. C., 45 arc lights (new); at Beverly, Mass., 30 arc lights (new); at Waterville, Me., 60 arc lights (new); at Troy, N. Y., 135 arc lights (new); at Cañon City, Col., 60 arc lights (new); and at Clinton, Ia., 75 arc lights (new). At Long Branch, N. J.; Poughkeepsie, N. Y.; Jacksonville, Ill.; Birmingham, Conn., and Newburgh, N. Y., the number of arc lights has been largely increased in plants previously installed by this company. The following incandescent plants have been installed: Norwich, Conn., 150 (new); Worcester, Mass., 300 (new); Lowell, Mass., 300 (new); Haverhill, Mass., 300 (new); and North Adams, Mass., 150 (new).

At the Massachusetts State House on Friday, June 11th, by a special assignment the report of the committee on street railways, leave to withdraw, on the petition of John A. Enos and others for authority to build an elevated railway in the town of Winthrop, came up. Mr. Burns, of Ayer, introduced an order which he asked to have substituted for the report of the committee. Mr. Creed, who had charge of the committee's report to the House, explained that this report of leave to withdraw was passed by the committee by a very close vote—4 to 3, and at the time the members were under the apprehension that any legislation giving the right to build the road was impracticable. Since then the members of the committee had changed their minds somewhat, and that now eight gentlemen out of the fourteen on the committee were in favor of the bill which Mr. Burns had introduced. Therefore, even though he thought he would vote against the bill's passage, he hoped it would be adopted as a substitute. Mr. Burns' substitute was accordingly so adopted. It provides that Erastus H. Doolittle, John A. Enos, P. S. Macgowan, C. A. E. Ewing, Walter Lanton, S. A. Freeman, Thomas N. Dwyer, and such others as may associate with them and become a corporation, under the name of the Winthrop Electric Street Railway Company, may maintain and operate by electricity an elevated railway, from a point at or near Winthrop Junction, in that part of East Boston known as Breed's Island, on the easterly side of the Boston, Revere Beach & Lynn railroad and Point Shirley.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, June 14, 1886.

It is well known that wires often remain strung after they have gone out of service, and thus become at once a nuisance to "live" wires, and a danger to the public because no one is charged with their maintenance or their removal. A few nights ago a Mr. Hendricks, living in Wallace street, this city, was seen busily engaged wire-cutting on his roof. Before Mr. Hendricks finished he had cleared the roof entirely of the wires, and upward of 100 were dangling on Wallace street on the south and in the adjoining yards on the north. The wires were the property of the Baxter Overland Telegraph and Telephone Company, and have been inoperative since the Bell Telephone Company's injunction compelled the Baxter to quit business. The wires were placed upon Mr. Hendricks' roof with the understanding that a support about three feet high, upon which but a few wires were to rest, would be used. Mr. Hendricks asserts that while he was away from home one day the company built a stand on his roof seventeen feet high and the full width of the building. To it were fastened upward of 100 wires, the weight of which caused the roof to settle to such an extent that none of the doors in the house would close. He repeatedly requested its removal, and finally called the landlord's attention to it. Mr. Petit gave the company fifteen days' notice to remove the wires, and upon its not complying he instructed Mr. Hendricks to cut them. The wires across Fairmount avenue below Tenth street were left entirely loose from all fastenings, and were held in mid-air by a single telephone wire. It seems to me that while it is well to clear dead wires away, the work should devolve upon some recognized and competent authority, and should not be left to anybody whom the spirit of destruction moves.

This little episode naturally leads up to the underground question, toward the settlement of which another step has been taken. It will be remembered that a few weeks ago I gave an outline of the proposed new regulations constituting a general ordinance on the subject. On June 8, the sub-committee of Councils to which was referred the ordinance met in the Select Council Chamber and molded the bill into shape for consideration by the general committee. A number of representatives of the companies to be affected were present, including Superintendent Gill, of the Western Union Company; Henry M. Bentley, of the Philadelphia Local Telegraph and Bell Telephone Companies; David Brooks, of the Brooks Underground Company; W. D. Sargent, of the New York & New Jersey Telephone Company, and E. J. Hall, of the American (long-distance) Telephone Company. Messrs. Gill and Bentley objected to the condition that all companies receiving privileges should furnish space for nine wires in addition to the three wires to be given to the city free of charge, holding that such a concession would be onerous. The objectionable clause was stricken out. The amount of bond to be required from each company was reduced from $10,000 to $5,000, and a clause imposing an annual license was stricken out entirely.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, June 12, 1886.

The American Train Dispatchers' Association held its third annual meeting at the Madison Street Theatre, Chicago, on Tuesday, Wednesday and Thursday of this week. Some two hundred members of the association were present. After Mayor Harrison had had his little say to the visitors, and President Lynahan had delivered an appropriate address, it was found that the following officers were in the room:

John W. Lynahan, Corning, N. Y., President; E. J. Peabody, Marion, Ia., Secretary; J. Fitzsimmons, Marshall, Tex.; Hugh Doly, St. Thomas, Ont.; C. A. McMasters, Denver, Col.; J. W. Stapleton, Chicago, members Executive Committee. Vice-President A. J. Fraser was absent, as were also three members of the Executive Committee.

Glancing around the room during roll-call the writer was pleased to note that the members formed an unusually bright and intelligent-looking body. Hardly a man in the assembly was more than 35 years of age, and the majority were undoubtedly under 30. Many of the members were accompanied by their wives. After reading communications from absent members, new names to the number of 253 were presented for membership. All were admitted on the first ballot except six and these six were admitted on a subsequent ballot.

The principal event of the afternoon session was the reading of the secretary's report. This report showed that all of the 282 members admitted at the Denver meeting last year had qualified except 30. Two members have died during the last year and two withdrawn. The present membership of the association, counting 10 honorary members, is 722; and counting the members just elected, 975. The following is the secretary's financial statement:

Receipts—	
Cash balance	$300.61
Entrance fees	786.00
Dues	1,152.00
Current interest	2.00
	$2,240.61
Total expenses	1,858.51
	$382.10

The report was evidently satisfactory to the members for the secretary and treasurer was warmly applauded at its conclusion.

Mr. J. B. McCormick here reported that the committee of which he is chairman had found the railroad superintendents in sympathy with the motives and aims of the association, and he was followed by the president, who spoke in a similar strain.

Nearly the whole of Wednesday was devoted to making certain changes in the constitution calculated to increase the efficiency of the order. The salary of the secretary was reduced from $600 to $480 per annum; and that of the treasurer was made $180 per annum.

The association concluded its business with the election of new officers on Thursday afternoon.

During the session the principal objects of interest about Chicago were visited, including the Board of Trade, and on Wednesday many accepted an invitation of the Illinois Central Railroad to see Pullman. The Chicago, Milwaukee & St. Paul Railroad placed a special train at the service of those desiring to visit Minneapolis and St. Paul, Friday morning.

The association is in good shape financially, is growing rapidly, and its object, the improvement of this important branch of railway service, deserves and receives the hearty encouragement of the railroad officials.

Only a week or ten days ago the Western Electric Company sent a 25 light arc machine to Clay Centre, Kan., and the citizens are so well pleased that the company has already received an order for an additional machine of the same size. Newark, Ohio, also has lately ordered a 25 light Western Electric machine.

The Sperry Electric Light Company has just received an order for 30 arc lights for Mason City, Ia.

The installation of the Ball electric light plant at Grommer & Uhlrich's place, Chicago, has been intrusted to the careful and capable hands of Mr. Forée Bain, electrical engineer, of 95-97 Indiana street, this city. Mr. Bain will be glad to take charge of work of this kind for Eastern manufacturers.

Telephone stocks, according to Col. S. G. Lynch, broker, 146 La Salle street, Chicago, stand as follows:

Bell of Mo.	$147@$150
Chicago	350@ 360
Central Union	44@ 46
Colorado	18@ 20
Cumberland	65@ 70
Great Southern	27@ 29
Great Southern Scrip, 90 cents on the dollar.	
Iowa Union	15@ 18
Michigan	63@ 65
Mo. & Kan.	54@ 56
Mo. & Kan. Scrip, 53 cents on the dollar.	
Rocky Mountain Bell	40@ 45
United	15@ 17
Wisconsin	104@ 106

W. A. K.

CENTRAL AMERICAN NOTES.

BOGOTA, U. S. C., May 15, 1886.

A new line has just been built in the Republic of Colombia, between the cities of Manizales, State of Antioquia, and Cartago, State of Cauca, which gives communication to two other cities besides; but the most important feature is that it opens two routes from the capital to the cable line at Buenaventura.

Recently, a newly-married man, spending his honeymoon in the suburbs of Bogota, was sitting in a doorway, during a storm, when his mother-in-law called him. He immediately got up, but he had not gone more than two paces when his chair and the glass in the room were shattered by a stroke of lightning. The price of mothers-in-law ought to rise after this. Later, however, the young man may wish that the lightning had struck him.

R. R.

THE TELEGRAPH.

Postal Lines Sold.—The lines of the Postal Telegraph and Cable Company located in Ohio were sold at auction in Cleveland on June 10th, to satisfy the judgments of Campbell, Brown & Thomas Fleming. The property was bought for Edward C. Platt, of New York. The amount paid was $46,000.

Does Not Want to Pay.—In the Kings County, N. Y., Supreme Court, on June 12, counsel for the Western Union Telegraph Company moved that an amended complaint be made in Samuel B. Dickson's suit against his client for $400,000. Mr. Dickson, it will be remembered, claims he was damaged that much by the failure of the Western Union to deliver a cablegram he sent to Guatemala. The court reserved its decision.

Messengers on Strike in Paris.—A Liliputian strike was inaugurated the other day among the juvenile messenger boys of Paris. Posters were profusely scattered announcing the strikers' grievances. These consisted of the recent reduction of the fee for carrying telegrams from ten to seven centimes, and a general meeting was called to discuss the following grave points: 1. Sneaks among us; 2. Partiality in examinations for promotion; 3. Unfair system of compensation for wear of boots; 4. Red tape and general despotism.

A Narrow Escape.—While working at the top of a tall Western Union pole in Harlem last week, a lineman named Castle was suddenly exposed to great danger by the breaking of the cross-arm on which he stood. As he fell headlong he clutched one wire with his hands and managed to hook his knee over another. His strength was failing rapidly hen a forty-foot ladder was brought to the spot by firemen, who, with the help of two of the linemen, succeeded in rescuing Castle by dint of great exertion. Castle was badly bruised and strained and was taken to the hospital.

The Cutting of the Wires Admitted.—When the suit of Receiver Farnsworth, of the Bankers and Merchants' Telegraph Company, against the Western Union Telegraph Company was continued last week before Judge Lawrence in the Supreme Court, a long discussion was held in regard to the production of the orders of the Western Union Company directing the cutting of the Bankers and Merchants' wires. Mr. Joseph H. Choate and his associate, ex-Judge Dillon, produced a general order, but ex-Senator Conkling said that this was not what he wanted. He desired each specific order that had been issued to the different employés. It was then conceded that the wires had been cut pursuant to orders issued from the Western Union Office here.

Is it a Deep Game?—In a recent circular, Messrs. Edward Sweet & Co. say: Mr. Gould's neglect of Western Union stock sets observers to thinking, and it is commonly supposed that he is playing some deep game. His policy has been to crush out opposing companies by forcible measures. These tactics fail in the present instance, but at the present rate of decline in Western Union shares it will soon be possible to absorb rival organizations by an exchange of stock share for share. The ostensible reason given out by members of the committee for the passing of the quarterly dividend is the great cost of the present war in cable rates. If this is the real cause, the passing of the dividend maybe considered a confession that the Commercial Cable Company cannot be forced into the pool. There is ground for the belief that the company is earning money, although the pooled lines may be losing it.

The Brotherhood.—A dispatch from St. Louis of June 12 says: A secret session of the delegates to the Convention of the Brotherhood of Telegraphers was held in Kansas City. The delegates were from all parts of the United States, and several of the most prominent were those who were active in the great telegraphers' strike in 1883. Ever since that time the fraternity have been quietly organizing upon a sound basis, but they have found it necessary to be very cautious in their movements, and it was for this reason that the Convention was held with such secrecy. The meeting was harmonious throughout, and a large amount of work was accomplished. Heretofore, the Brotherhood has been an independent organization, the various local councils formulating such rules and by-laws as were deemed necessary for their proper government. The rapidity, however, with which the organization has increased of late has made it necessary to more thoroughly systematize the working of the separate councils under a general head. It was for this purpose that the Convention was called, and after mature deliberation it was unanimously resolved to fall in line under the banner of the Knights of Labor. This was the principal business of the meeting, and it was completed. The Convention adjourned *sine die*.

THE TELEPHONE.

Will She Say "Hello, Central"?—The Queen is considering the desirability of having a telephone in Buckingham Palace.

Crumbs of Comfort.—The American Bell Telephone Company has declared a dividend of $3 per share payable July 15, 1886.

The "Popular Telephone Company" has been organized at Concord under the general laws of New Hampshire. If the laws of New Hampshire can make a telephone company popular, they had better be applied to all such companies in the country.—*Lowell Courier.*

Mr. W. Van Benthuysen told a New Orleans reporter last week that while the telephone decision there in favor of Bell was a surprise to him, he was not dismayed. "I realize the Herculean task of a contest with two gigantic monopolies wielding an influence of $150,000,000. I have learned that success is not attained by every move. We have had our successes in rapid succession, and it should not be forgotten that a reverse now and then is part of the inherent nature of war."

The Million-Dollar "Bear" Syndicate.—In a Chicago paper, on June 10, Mr. A. E. Davis disclaimed any connection with a syndicate organized to bear Bell telephone stock on the strength of a foreknowledge of Secretary Lamar's decision. Mr. Davis said to a reporter: "I was furnished information concerning Secretary Lamar's decision. Armed with this information I secured a million or more dollars to be used in utilizing it to the best advantage." But the opportunity to utilize did not present itself.

Reading, Pa.—A dispatch of June 12 from Reading, Pa., says: The Board of Trade of this city has got on its mettle in regard to the inefficient service of the Eastern Pennsylvania Telephone Company, and this evening held an indignation meeting, which was attended by many prominent business men, who ventilated their grievances before the telephone company's general manager, who was present. The complaints were mostly for impolite attendants or dilatory answers, and the inability of the operators to accommodate with any reasonable promptness on either the combination or exclusive lines. The night service is farcical, the operator frequently being asleep at her post. If a change for the better is not soon made a combined effort will be made to throw this company's lines out of use.

Annual Meeting of Erie.—The annual meeting of the stockholders of the Erie Telegraph and Telephone Company was held at the Coleman House, New York, on June 8. The Treasurer's and Auditor's reports, which have heretofore been published, were presented, and it was voted that the same be accepted and placed on file. A ballot for directors resulted in the re-election of the old board, as follows: James W. Bennett, Charles J. Glidden, Charles E. Adams, Francis Jewett, A. C. Russell, A. W. Sherman and J. W. C. Pickering, of Lowell; W. J. McKinnie, of Cleveland, O.; Wesley A. Gove, of East Boston, Mass., and James A. Weston, of Manchester, N. H. The vote was unanimous in all cases. The annual meeting of the directors was held at 11:30 A. M., and the following officers were elected for the ensuing year: President, James W. Bennett; Secretary and Treasurer, Charles J. Glidden; General Manager, James P. McKinstry; Transfer Clerk, Charles A. Grant.

Pan-Electric Committee Reports.—A dispatch of June 10 from Washington says: Representative Ranney's report on the Pan-Electric investigation has been very much misrepresented in the statements purporting to give abstracts of it. They vary widely from the facts. Representative Ranney is restrained by considerations of propriety from refuting them by publishing his report at this time. It would not be proper, he thinks, for him to make it public until Chairman Boyle of the investigating committee has made his report. It is not known yet how Representative Hale, of Missouri, a Democratic member of the investigating committee, will act in regard to the two reports. Whichever one he signs will then become the majority report, because the other members of the committee are equally divided. While Representative Ranney is not willing to make any positive statements about his report, he authorizes a denial of the statement that he alludes in his report to the managers of the National Improved or the Pan-Electric Company as "hyenas." The word does not occur anywhere in his report, nor does he apply any other epithet to any person or persons referred to in it. It is understood that it simply sums up the evidence, with no more comment than is necessary to elucidate it, and that the comment is in an entirely dignified and judicious manner.

THE ELECTRIC LIGHT.

Brookline, Mass.—The Brookline Electric Light Company has received its third Armington & Sims engine this week. It will now be able to furnish 180 arc lamps.

A Summer Night's Festival.—Brilliant effects with ten thousand Edison incandescent lamps are promised for the Festival of the Liederkranz at Washington Park, this city, on June 26.

The Arion Society's Club-House on Park avenue, of which the foundation stone was laid last week, will be one of the finest buildings in the upper part of New York City. It is to be lighted by electricity from an isolated plant.

Joliet, Ill.—The Business Men's Electric Light Association, of Joliet, Ill., has been organized with a capital stock of $20,000. Among the incorporators are Messrs. J. O. Gorman, Jr., J. D. Paige, J. C. Barrett and G. L. Vance.

A Characteristic Action.—Without any demand on the part of his employés, Mr. J. Frank Morrison has reduced the hours of labor at Morrison's Electrical Works, Baltimore, to nine hours per day, no equivalent reduction in pay being made.

Hornellsville, N. Y.—The American Electric Illuminating Company, Hornellsville, N. Y., are erecting an electric light station. They will use two Armington & Sims Company engines, and set their boilers with the Jarvis patent furnace.

The Automatic Electric Light Company has been organized at Portland with the following officers: President, Charles H. Magoon; Treasurer, George D. Burton; Directors, Charles H. Magoon, Luther E. Lewis, George D. Burton, Josiah T. Wilson, Murray D. Livingston. Capital stock, $100,000.

Amesbury, Mass.—A company has been formed and incorporated as the Electric Light and Patent Wood Floor Company. A committee of the company is to confer with a town committee regarding a contract to light the streets. So far as investigations have gone, the Thomson-Houston system is that most favored.

The Westinghouse Illuminating Company, of Schenectady, starts with a capital of $30,000, and an expectancy of 50 years' existence. It has filed a certificate of incorporation. The trustees are J. Westinghouse, Walter C. Kerr and Henry H. Kerr. They will manufacture and sell light, heat and power.

Rochester, N. H.—This plant, put in by Messrs. Frenyear & Razee, started on June 5, and is now running quite smoothly and successfully. One of the inhabitants remarked: "Say, putty hard to snuff them things out, ain't it?" There is no gas in the town, and the jump to electricity from kerosene and gasoline is a long one.

A Happy Village.—The beautiful little suburban village of Wayne, on the main line of the Pennsylvania Railroad, which Messrs. Childs and Drexel have done so much to make an ideal rural home, will, after next week, be lighted with electric lamps. An electric light plant has been constructed at a cost of $20,000, which will supply all the houses with incandescent lamps and furnish the streets as well with light.

Omaha, Neb.—Articles of incorporation were filed on June 7 at Omaha, with the county clerk, for the Edison Illuminating Company of Omaha, the object of which is to furnish electric light and sell machinery for the production of the same. The capital stock is $200,000, divided into 2,000 shares of $100 each. The incorporators are H. E. Jacobs, J. J. Dickey, Wm. Wallace, L. H. Korty, L. M. Rheem, F. A. Nash and F. Drake.

Lowell, Mass.—The treasurer's report to the stockholders of the Middlesex Electric Light Company for the year ending May 31 last shows a prosperous state of affairs. There were at that date 270 arc lights in use, 73 on poles in streets, and 197 in stores, offices and public buildings. The whole number of shares of stock is 15,000, at a par value of $10 each. The stock sold and issued to stockholders is 13,108 shares. The net earnings for the year ending May 31 were $12,912.99, or $9\frac{5}{10}$ per cent. on the shares issued, or $8\frac{6}{10}$ per cent. on the total capital stock. A dividend of six per cent. for the year has been declared and paid, and the temporary loan account reduced $2,000. Mr. John H. McAlvin is treasurer.

APPLICATIONS OF POWER.

Scranton, Pa.—The Scranton Suburban Railway Company has obtained permission from the Council to lay down rails and to operate by electricity. The Van Depoele Electric Manufacturing Company is negotiating to furnish its electric motor system for the line on plans similar to those adopted by it for South Bend, Ind.; Toronto, Can.; Montgomery, Ala., and Appleton, Wis.

Winthrop, Mass.—The Massachusetts House of Representatives has now admitted as a report of committee a bill to incorporate Erastus H. Doolittle, John A. Enos, P. S. Macgowan, C. A. E. Ewing, Walter Lawton, S. A. Freeman and Thomas N. Dwyer as the Winthrop Electric Street Railway Company, to run from Winthrop Junction to Point Shirley. Capital is to be $30,000 a mile, of which 10 per cent. must be paid in before beginning.

St. Louis, Mo.—A dispatch of June 14, from St. Louis, says: There will be introduced into the House of Delegates to-morrow evening a bill authorizing the construction and maintenance of an electric elevated railway, double track, standard gauge, with sidings, turn-outs, and buildings. The franchise will be asked by Thomas O'Reilly, his assigns and successors. The termini of the road will be at Fourth street and Forest Park, the distance between being about four and a half miles. The bill provides that the road shall be constructed as nearly as possible over the middle of the streets, upon machine wrought iron, and the motive power shall be electricity only. Mr. O'Reilly says that Eastern capitalists will furnish the money, and will commence the construction of the road within a week after the passage of the bill.

Kansas City.—A meeting of the stockholders of the Kansas City Electric Railway Company was held on June 4, at which William Chrisman and Warren Watson were chosen temporary Secretary and Treasurer. The following Board of Directors was elected: William Chrisman, W. W. Kendall, W. E. Winner, H. L. McElroy, W. Watson, Theodore S. Case and Benjamin Estill. The company is now on a good financial basis, and will commence operations as soon as the Council will allow them. At the next annual meeting of the Council an ordinance will be introduced permitting the erection of poles on East Fifth street, from Grand to Lydia avenue, and as soon as such permission can be obtained work will be begun. Mr. Henry, the inventor of the motor and electrician for the company, has come East to purchase machinery.

PERSONALS.

Mr. Stephen D. Field is now in much better health than he has enjoyed for some time past. He has been able to resume experimental work, and has installed a small Shipman engine in his private laboratory at Yonkers for power.

Mr. David Van Nostrand, the well-known scientific and military publisher of Murray and Warren streets, this city, died on June 14, at his residence, 23 West Twentieth street. He came of an old New York family, and was born in 1811. He was connected nearly all his life with the book trade, and enjoyed the acquaintance and friendship of a great many leading scholars and writers, especially those engaged in scientific work. His establishment has long been a resort of naval and military men. Mr. Van Nostrand was a prominent member of the Union League and Century Clubs, and of the St. Nicholas and Holland Societies. He was twice married, but leaves no children. His second wife survives him.

Henry Ward Beecher was killed the other day—through the ticker tapes. He explained the occurrence later: "I am going abroad on the 19th of this month. If all the things were true that have been said of me, I should have been spared that journey. The only explanation I can give of the probable origin of so ruinous a report is this: I am told that the strike on the Bleecker street horse-car line ended yesterday morning, and that the fact was announced in Wall street on the tickers in these words: 'Bleecker strike dead,' and the bulletins therefore announced 'Beecher struck dead.' But that 'l' and that 'k' saved me, although this rumor gave some temporary pain and anxiety to those very near me and to my family. Yet I am glad and grateful for the opportunity of receiving the evidences of interest and sympathy, the waves of which are still rolling in from every direction."

Mr. Charles Selden put in some excellent work for the Baltimore & Ohio Telegraph Company during President Cleveland's honeymoon at Deer Park. The special arrangements during the stay were perfect, and it is said that Mr. Selden did the reporters great service on the homeward trip. They had to leave nine minutes ahead of the President or wait twelve hours for another train. As Manager Selden was to ride on the special with several operators, the reporters agreed to bear the expense of writing and telegraphing if he would send brief accounts of incidents along the route to the train ahead on which the reporters rode. He said he would gladly have it done without charge, and the accounts of that trip were gathered from dispatches dropped by him at stations where the special stopped and delivered to the reporters on the train ahead. During the visit of five and one-half days the telegraph company handled at Deer Park nearly 400,000 words, and no one complained of an error or delay.

Mr. Daniel D. Dickey.—We clip the following from Pittsburgh papers of recent date: The residence of Dr. W. R. Hamilton, last evening, on Ninth street, at 7 o'clock was the scene of a joyous wedding. The well-known physician's accomplished daughter, Miss Helen R. Hamilton, was married to Mr. Daniel D. Dickey, of the Pittsburgh Carbon Company. Rev. D. R. Kerr performed the ceremony, and was assisted by Rev. D. C. Stewart, of Frankfort Springs. The groom is a son of the late Isaiah Dickey, well remembered by all old Pittsburghers, and also a brother of C. C. Dickey, Esq., and a brother-in-law of Mr. R. S. Waring. Miss Hamilton is one of the most esteemed members of society. After a splendid wedding supper by Kennedy the couple went East on an extended tour. Interest was added to the occasion by the statement, in Dr. Kerr's happiest manner, that about 30 years ago he had united the parents of the bride. The young couple have the best wishes of their many friends.

MISCELLANEOUS NOTES.

Compasses Veered by Iron.—An Associated Press dispatch in regard to the stranding of the steamer "Bernard" at Moriches, L. I., says that her compasses had been so affected that when she was going due north they made it appear that she was bound due west.

A Fire Alarm System for Norwalk, Conn.—The authorities of Norwalk have made a contract with the Gamewell Company through Mr. C. A. Rolfe, its agent, for the introduction of the Gamewell fire alarm system. Five non-interference boxes of the most improved make were ordered at first, but two more are required. The order also includes five gongs for fire stations and one tower bell striker for general alarm. The circuits will take about five miles of No. 12 hard-drawn copper wire, on poles. The Gamewell system has now been placed in about 200 towns and cities, using from 1 to 1,000 boxes.

Colliery Draining.—An accident to the pump-rod of a deep well used in draining a colliery in England brought out a new use for incandescent electric lights. Work had to be carried on in the well six hundred feet from the surface and under water. Divers were employed, and they had with them a heavy iron lantern with a glass globe bottom, the whole inclosing four incandescent lamps and a reflector. A primary battery of fifteen cells furnished the electric current, and a light of about 80 candles, concentrated in a sphere of six feet in diameter, was obtained under water. With this great aid the work was carried on without the least delay or difficulty.

The Polarity of Tadpoles.—The following, says the *Centralblatt für Elektrotechnik*, is reported about an interesting experiment of the physiologist, Prof. L. Herman. In a flat bowl filled with water, in which a number of 14-days' old frog-larvæ (of *rana temporaria*) were disporting themselves, were sunk along the narrow side ready for an experiment thick zinc wires connected with a battery of 20 little zinc carbon elements. When the current was made the whole of the little animals fell into a wriggling motion, which soon ceased. But all the larvæ without exception had taken up one position in which the head was turned to the anode and the tail to the cathode. The animals remained in this position till the current was again broken, when they again fell into the wriggling motion, but now less violently. Repeated experiments proved that the living animals showed a decided polarity, placing themselves along the stream lines of a current with their heads all in one direction, this direction being reversed when the commutator was reversed—that is, the current was reversed. An explanation of this interesting phenomenon has not hitherto been given.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—B. & M., b 2¼, a 3; Western Union, b 62½, a 62¾.

Telephone.—Am. Bell, b 180, a 182; Erie, b 27, a 28; New England, b 34½, a 35.

Electric Light.—No new quotations.

BUSINESS NOTICES.

The Pond Engineering Company, of St. Louis, Mo., has issued a remarkably neat, useful and valuable catalogue of steam and hydraulic machinery. It includes full details in regard to Armington & Sims engines, Jarvis furnaces and other well-known features of successful electric light stations. At the end are some very complete tables of steam pressure, percentage of fuel saving by heating feed-water, comparisons of columns of water in feet, fire streams, areas of circles, desirable size of chimneys with approximate horse-power of boilers and the like. The company may well be consulted by any of our Western friends who need the services of competent engineers and contractors.

Memorandum Book of Wire Tables.—One of the most convenient small books of reference which we have yet seen is that just issued by the Western Branch of the Electrical Supply Company. Besides the tables of resistance, weight, etc., of conductors, the little book contains valuable rules for wiring incandescent lamps, and for the transmission of power, etc., together with the requirements of the New York Board of Fire Underwriters and the Chicago Electric Light Laws. Among the various gauges given, we notice also the new British, which has been nominally adopted in some cases in this country. There are also several practical suggestions regarding the making of joints in wire.

Glenn's Sulphur Soap
Heals and beautifies, removes pimples and blemishes; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure, 25c., 50c. and $1.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

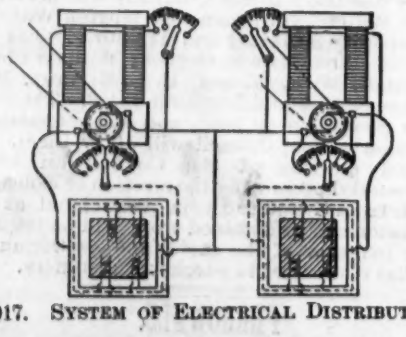
PATENTS DATED JUNE 1, 1886.

342,775. Telephone Transmitter; Alfred Beale, New York, N. Y., Assignor to himself and L. B. Clark, of same place, and E. R. Wiggin, Boston, Mass. The object is to be able to employ strong currents. To the centre of the diaphragm is secured a post of carbon or other suitable material, having formed in its sides sockets for receiving the cylindrical carbon electrodes. The cylindrical carbon electrodes extend radially from the post parallel with the diaphragm and beyond its periphery, and tenons formed on the outer ends of the electrodes are received in sockets in the posts.

342,777. Meter; Philip Cardew, Chatham, England. There is a straight conductor maintained in a state of tension and heated by the passage of a current, and appliances for measuring the current.

342,872. Stopping Device for Motors; Edwin Leigh and Thomas Townend, Fall River, Mass. The stopping device acts directly upon the valve-gear controlling the valves which admit the steam to the ends of the engine-cylinder, being arranged in such relation to the said valve-gear that when the stop-actuating device is released by the detent the valves are prevented from opening and no steam is admitted to the engine-cylinder, so that the engine will stop as soon as its momentum is overcome.

342,881. Induction Telephone Repeater; Sidney F. Shelbourne, New York, N. Y. It consists of two parallel circuits of substantially equal length and resistance in identical corelation with each other about two or more independent magnetic cores, forming induction giving and receiving circuits (each to or from the other). See page 284.



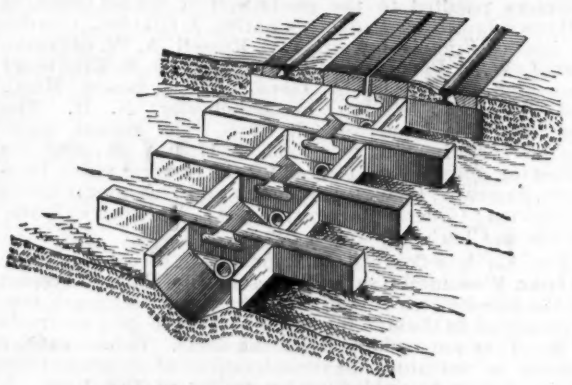
343,017. SYSTEM OF ELECTRICAL DISTRIBUTION.

342,892, 343,099. Conductor; Edward C. Acheson, New York, N. Y. The first consists of a line-wire, an insulating covering for the same, a continuous homogeneous metallic shield of thin and flexible material and a protective covering. The second relates to a process which consists in covering insulating conductors with an electrolytically deposited shield by first depositing a comparatively hard crystalline layer, and then depositing upon the same a comparatively soft and flexible layer.

342,947. Induction Coil; Alfred M. A. Beale, New York, N. Y., Assignor of two-thirds to Lemuel B. Clark, of same place and Edwin R. Wiggin, Boston, Mass. The wire is first coiled into helices, which are relatively disposed as shown in the diagram.

343,008. Controlling Armatures; Charles L. Clarke, Orange, N. J. Consists of a laterally flexible mechanical connection between the support and the armature, receiving a lateral flexure when the armature is in one position and approaching a straight line as the armature is moved into the opposite position.

343,014. Prevention of Disturbances on Telephone Lines; John E. Dann and John E. Lapp, Honeoye Falls, N. Y. The device is composed of interior and exterior



343,076. ELECTRICAL RAILWAY.

rubber tubes, an interposed copper cylinder and an insulated earth wire attached to the latter.

343,017. Electrical Distribution; Thomas A. Edison, Menlo Park, N. J. A complete diagram view is shown in the cut.

343,042, 343,043, 343,044. Automatic Telegraphy; Ed. J. Mallett, Bay Side, Long Island, N. Y. 1. Relates to an automatic printing telegraph, and consists of a stopping mechanism, increasing devices brought into action by the operation of said stopping mechanism and automatically operating when thus brought into action to release the transmitter from the control of the stopping mechanism. 2. A card, fillet or strip for automatically controlling telegraphic transmission has the symbols of the code marked thereon in indications of similar character arranged in transverse lines, in each of which they may follow one another in code succession and at varying distances from a fixed initial point or from the edge of the card or slip. 3. Consists in combining with a telegraphic circuit, and circuit making and breaking devices a transmitting fillet or ribbon for controlling the same having the code-symbols constituting the message formed thereon each as a dot or point of the same character arranged in one or more rows and at varying distances from one another and from a fixed initial point, whereby the value or designation of each symbol in any one row is determined by the position it occupies lineally in that row with respect to the fixed initial point, and receiving devices adapted to reproduce upon a fillet or ribbon the symbols in the same relative positions as in the transmitting fillet or ribbon.

343,053. Incubators; Preston C. Morse, Natick, Mass. Relates to details of construction of an electric valve regulator.

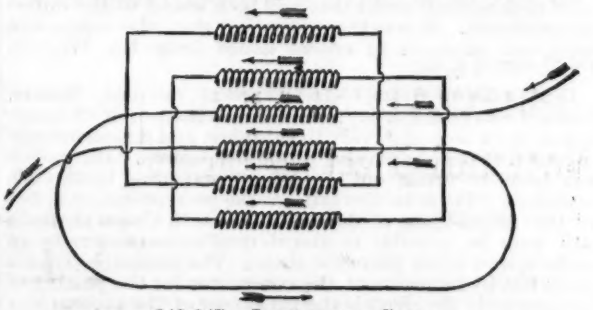
343,076. Electric Railway Conduit; Sidney H. Short, Denver, Col. The conduit is shown in the cut.

343,081, 343,082, 343,083, 343,084. Cable Conductors; John J. C. and Michael Smith, Passaic, N. J., Assignors in part to John H. Cheever, New York, N. Y. 1. Consists in laying the conducting wires around a hollow core adapted for the forcing through it of insulating material in a melted state, covering the said wires with an impervious envelope of insulating material, and subsequently filling the interstices between the conducting wires, envelope and core with insulating material forced in in a melted state. 2. Consists of a hollow spiral core, insulated conducting wires, an impervious envelope and a filling of wax or other fusible insulating material. 3. Consists in laying any desirable number of conducting wires with fibrous coverings around a hollow core having passages in its walls, enveloping the said body of conductors in an impervious envelope, forcing heated liquid through the cable to remove the air and heat the interior, and subsequently forcing in insulating material in a melted state to fill the interstices between the conducting-wires. 4. Consists in winding the wire and covering upon a drum which slowly rotates in the vulcanizing vessel.

343,087. House-Wiring; Luther Stieringer and Jonathan H. Vail, New York, N. Y. Consists of main conductors, several independent lamp or fixture circuits taken from the main condutors at the same point, all such conductors being in pairs and forming complete or metallic circuits.

343,095. Telegraph; Charles W. Williams, Cave City, Ky. Relates to telegraphing from moving trains, and consists in combining with a main-line circuit a series of consecutive train-circuits, one of the connecting wires of which is common to two adjacent train-circuits, and means for producing in said main or either of said train-circuits electrical impulses similar to impulses which have been produced in said train or main circuits.

343,101. Railway; Edward M. Bentley, Brooklyn, N. Y. Consists in insulating a section of the main con-



342,947. INDUCTION COIL.

ductor of an electric railway at a point where the railway crosses a road, and providing automatic circuit-closers by which the said section is thrown into electrical connection with the main conductor whenever an electric locomotive is passing over it.

341,129. Dynamo; Arthur G. Ketchum, Winchendon, Mass. The armature is made up of rings having dovetail or semicircular notches, in which are retaining bolts that pass through the ends of the spiders. The pole pieces envelop nearly the whole armature. For full description see page 283.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, 9 Murray st., New York.